ANALYSIS OF SMALL SYSTEMS SERVICE

1986

INPUT

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I INTRODUCTION

- This is the first in a series of reports covering the small systems market produced by INPUT for clients of the 1986 Customer Service Program. To minimize elapsed time between research completion and the delivery of the research findings, INPUT has adopted a new format for the 1986 program. Instead of separately bound, cumulative reports on an entire market segment (in this case the small systems market), INPUT will now deliver individual vendor's user analyses and vendor profiles as quickly as the research is completed. These modules will usually be released in groups of three to five analyses, shrink-wrapped and three-hole punched to facilitate placement in three-ring binders. Each service module (large systems, small systems, third-party maintenance, telecommunications, and software support) can be filed in clearly identified sections within each binder as received. As additional analyses are completed and delivered to clients, an updated table of contents will accompany the analyses.

- The first in the series of deliverables are the small systems user requirements/vendor performance analyses. In this section, which is to be filed in Section III of the small systems binder, user service requirements in the areas of hardware maintenance and systems software support are compared to actual vendor performance. Specific services analyzed include documentation, spare parts availability, engineer skill level, consulting, and training. Each analysis provides traditional measures of vendor performance, such as systems availability, response time, and repair time. Lastly, each analysis explores user attitudes toward alternative service delivery, whether that alternative is third-party maintenance, increased levels of service from the manufacturer in the form of premium services, or even increased levels of participation by the users themselves in the support of their own equipment.

- The small systems module will cover three product categories that are increasingly overlapping. At the upper end are superminicomputers, such as the AT&T 3B, Digital Equipment Corporation's VAX 11/7XX, IBM's System 38, and the Tandem Non-Stop. At the lower end, sophisticated microcomputer systems, such as the IBM PC AT, the DEC Micro VAX II, and the AT&T 6300, are analyzed. And "squeezed" between (at least in an applications sense) are the traditional minicomputer systems, represented in this study by such systems as the DEC PDP 11/70, IBM System 36, and the Hewlett-Packard 3000.

- The next series of deliverables in the small systems module will be the company profiles of leading small systems vendors. The in-depth analyses of these service organizations will provide information on each vendor's hardware maintenance activities, software support services, educational service offerings, and professional service options. In addition, a description of each vendor's involvement in such critical areas as third-party maintenance and telecommunications support will be covered. As always, each profile will provide information on the service organization's structure, both internally and as a part of the company's corporate structure. Finally, each profile will provide an analysis of the future direction expected for that company's service organization.

- Again, to reduce the elapsed time between completion of the research and the delivery of the research findings, these small system vendor profiles will be delivered in groups of three to five modules and will be filed in Section IV of the small systems binder. As with the user series, an updated table of contents will be provided as new segments are released.

- The last deliverable in the small system module will be the Service Market and Forecast, 1986-1991. This report, to be filed in Section V of the small systems binder, will provide both current and future market size forecasts for small systems maintenance and support. Separate components of this market, including hardware maintenance, software support, educational services, and professional services, will be explored. In addition, this report discusses the key service issues of the past year, with an emphasis on their future impact on service. Lastly, this report provides strategic recommendations based on the entire year's research activities.

- Along with the Service Market Analysis and Forecast, 1986-1991, each client will receive copies of the Executive Overview, which will provide a summary of the key findings of the year's research. These summaries are prepared in presentation format, facilitating slide preparation. As a result, these summaries are popular with many service executives as a source of presentation graphics with corresponding text provided. The Executive Overview should be filed in Section II of the large systems binder.

- The binder contains an Appendix section for information that may be sent at various times during the year. Summary exhibits, industry definitions, and questionnaires are examples of appendix information that would be filed in this section.

II EXECUTIVE SUMMARY

A. THE 1986 CUSTOMER SERVICE MARKET

- As shown in Exhibit II-1, the peripheral market (made up predominantly of disk drives, tape drives, controllers, printers, and terminals) has caught up to the large systems market as the most significant service market in terms of user expenditures. Large systems market service revenue growth has been slowed by a number of factors, including decreased capital spending by large corporate users, increased competition for the systems market by lower-priced alternatives, and reduced services prices, reflecting increased system availability and service competition.

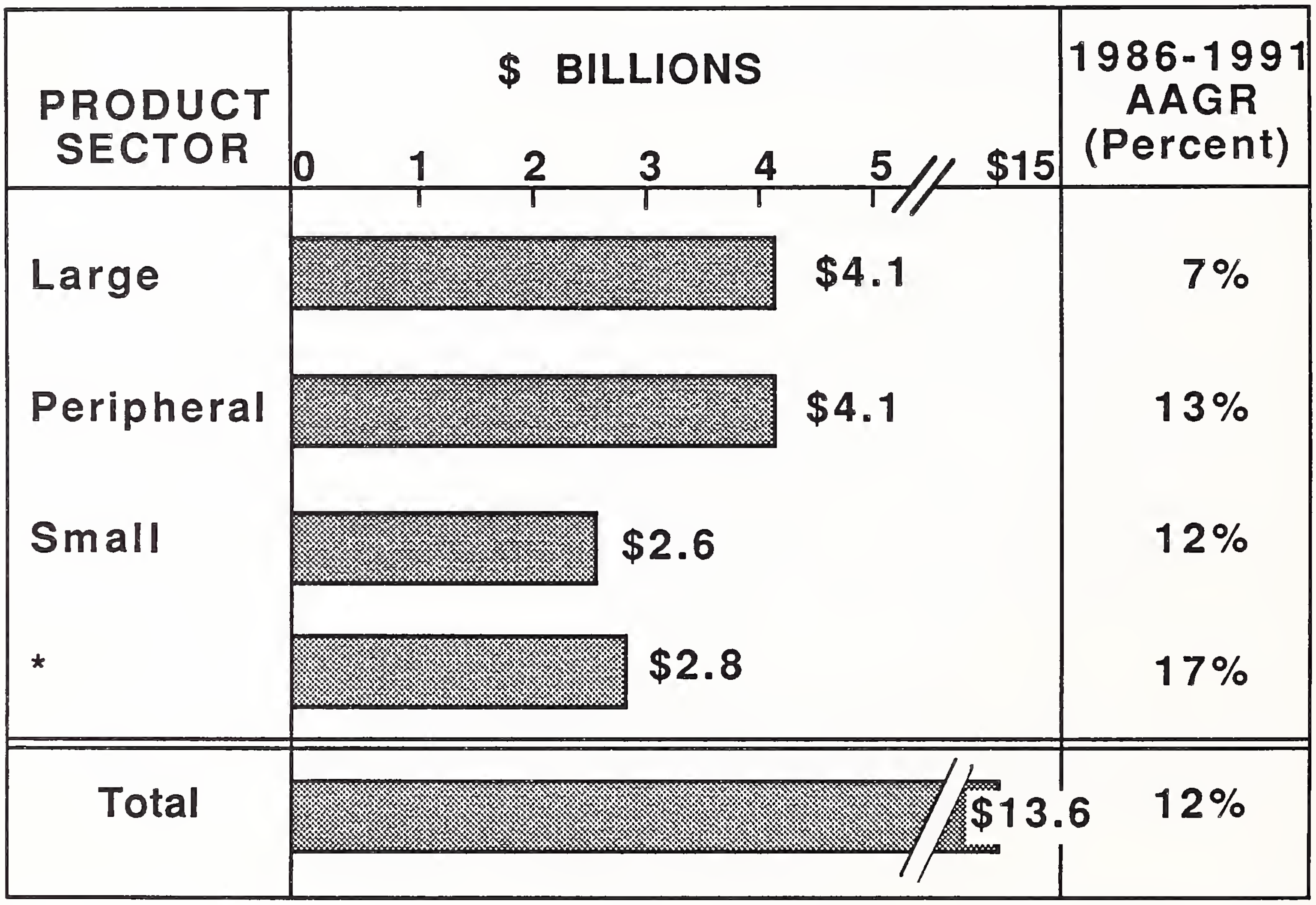
- Peripheral sales and service growth has been aided by user resistance to purchasing new large systems, preferring to expand their current systems with additional memory.

- Small systems growth is becoming increasingly segmented--superminicomputer sales and service is growing rapidly as users are attracted to the improved price/performance ratings of these new machines (e.g., DEC VAX 8XXX). Traditional minicomputer growth is stagnant due to increasingly powerful supermicros.

- Telecommunications growth is fastest over the forecast period at 21% AAGR; however, the market is currently small and not well defined.

EXHIBIT II-1

1986 CUSTOMER SERVICE REVENUE BY SECTOR



* Comprised of Micro, Telecom, and Other

B. THE CHANGING MIX OF SMALL SYSTEMS SERVICE

- Over the next five years, the small systems service market will grow through an evolutionary process as hardware maintenance activities become downplayed and other (currently "premium" services) become much more important both in terms of revenues and in their impact on user satisfaction.

- As shown in Exhibit II-2, hardware maintenance activities will continue to provide the lion's share of service revenues; however, the percentage of revenues contributed by hardware maintenance activities will decrease from 80% in 1986 to 70% in 1991. Principal reasons for this shift include:

    - Increased hardware reliability as systems become modularized and multiprocessor in design.

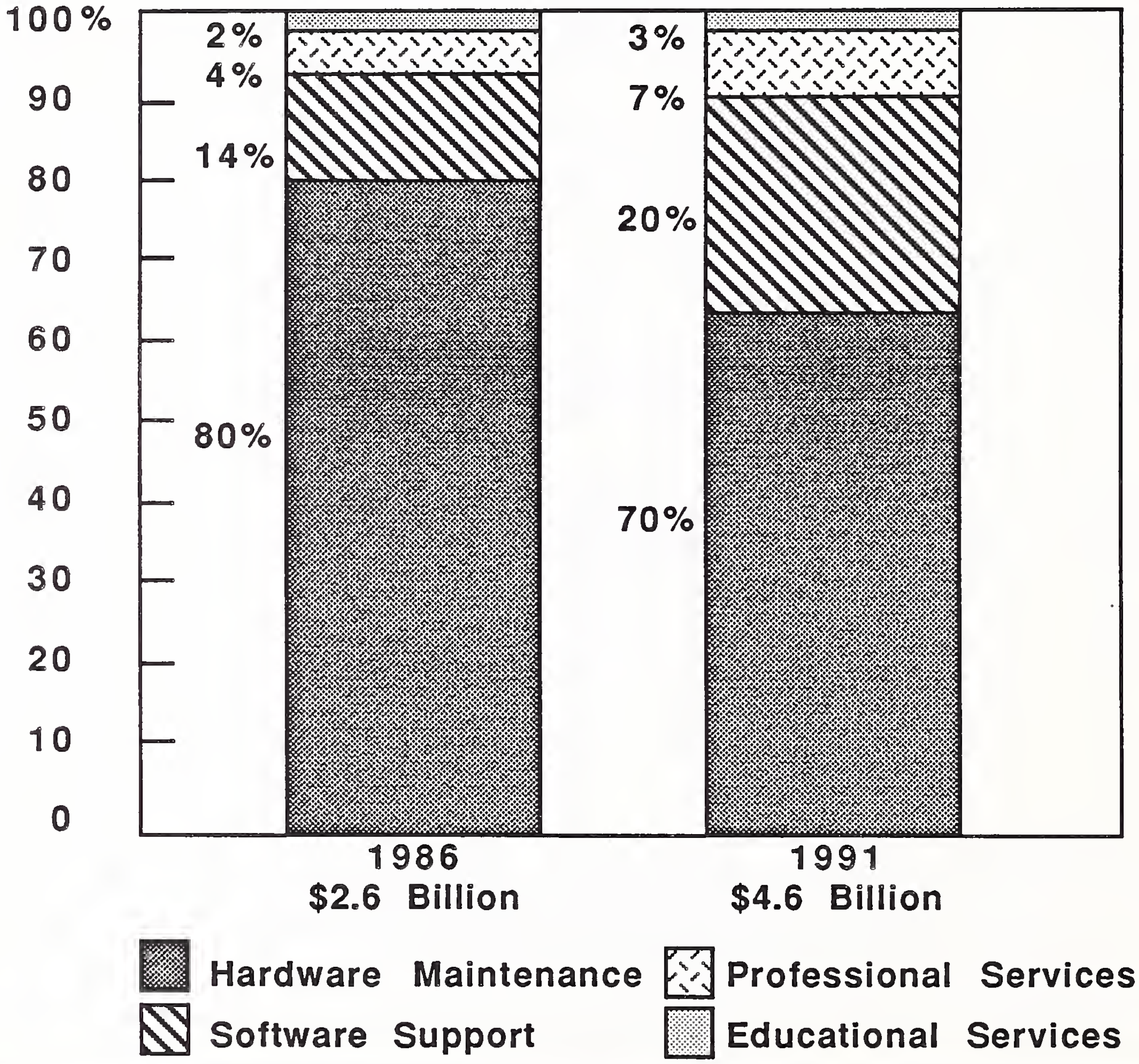
    - Increased use of remote support services, further reducing downtime caused by hardware failures.

    - Increased user pressure to reduce hardware maintenance prices as users recognize the reduced costs involved in supporting more reliable hardware.

- Instead, the service mix will reflect increased software support and professional services as user requirements for these services, along with the increased revenue and profit potential associated with these services, increase vendor activity in these two service areas.

EXHIBIT II-2

CHANGING MIX OF SMALL SYSTEMS SERVICE



C. SMALL SYSTEMS USER DISSATISFACTION WITH KEY SERVICES

- INPUT's small systems user service requirements analysis demonstrated that while users reported general satisfaction with the hardware maintenance that they received from their vendor (57% of the total sample were satisfied with their overall hardware service), software support remains a problem area (only 45% of the sample were satisfied with their overall software support).

- Exhibit II-3 presents the four service areas that received the highest requirement ratings from the small systems sample. While the majority of the sample were satisfied with their hardware (field) engineer, less than half of the respondents were satisfied with the software engineer (47%), spare parts availability (45%), and software documentation (40%).

- Satisfaction with their software engineers' skill level should rise as more software engineers become available in the industry. However, software documentation remains an industry-wide problem. Service organizations must attempt to gain more influence in the design and implementation of documentation, especially in light of the disturbing number of software problems reported that result from user misunderstanding or misuse of the software.

- The need to improve overall satisfaction with software support will become increasingly important as small systems become increasingly software dominated.

D. KEY SMALL SYSTEMS VENDOR PERFORMANCES

- Unlike the large systems market, which is becoming increasingly dominated by IBM and the plug compatible manufacturers (Amdahl and NAS), the small systems market competition reflects the diversity of applications for the

EXHIBIT II-3

SMALL SYSTEMS USER DISSATISFACTION WITH KEY SERVICES

SERVICE	PERCENT USERS SATISFIED	REQUIREMENT*
FE Skill Level	59%	8.7
SE Skill Level	47%	8.5
Spare Parts	45%	9.0
Software Documentation	40%	8.5

*Rating: 1 = Low, 10 = High

systems. While most attention seems to be focused on the leading two vendors (IBM and DEC), other vendors have been successful targeting specific industries or applications.

- Tandem, for example, has risen quickly in the ranks by concentrating on the on-line transaction processing market. With sales growth (17%) that exceeds the overall industry and service revenue growth of 30%, Tandem has been successful targeting users with high system availability requirements who are attracted to Tandem's fault-tolerant design.

- Another fault-tolerant leader, Stratus Computer, rewards their high system availability users with extremely low service prices (3.5% of list price) for users who opt for self-maintenance contracts combined with telephone support.

- DEC and IBM battled it out with new superminicomputer products (the VAX 8XXX and System 9370, respectively) that promise improved price/performance, high system availability, and low service prices.

- Exhibit II-4 presents the sales and service performance of these four key small systems vendors.

E. SMALL SYSTEMS SERVICE MARKET TRENDS

- As shown previously, the picture of small systems service is slowly changing, reflecting the improvements in hardware design, manufacturing, and support. User satisfaction with small systems support is currently being held back by user dissatisfaction with software support. In the small systems market, user requirements for software support are increasing rapidly as small systems applications (office automation, departmental processing, networked systems) become increasingly software-oriented.

EXHIBIT II-4

KEY SMALL SYSTEMS VENDOR PERFORMANCES

VENDOR	SALES GROWTH 1984-1985	SERVICE GROWTH 1984-1985
IBM	9%	20%
DEC	20%	23%
STRATUS	86%	*
TANDEM	17%	30%

* Stratus 1984 Service Revenues Were Negligible

- In addition, users are integrating more telecommunications equipment into their data processing systems. As a result, users will require more complete professional services offerings, particularly in the areas of system integrating, network planning, and industry- and application-specific consulting services.

- By expanding their service offerings in these areas, small systems manufacturers will be able to limit TPM penetration into their service market by better differentiating their service offerings from those of third-party maintenance companies who tend to be more hardware maintenance-oriented (thus compete more on a price basis).

- Exhibit II-5 summarizes these points.

EXHIBIT II-5

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SMALL SYSTEMS SERVICE MARKET TRENDS

- Increased Emphasis on Software Support
- More Telecom Services; e.g., Network Planning
- Continued Development of Remote Support
- Service Will Become Niche-Oriented
- TPM's Penetration Will Be Held Off

III A. HEWLETT-PACKARD

- INPUT interviewed 25 HP 3000 users in the months of April and May 1986, attempting to measure user satisfaction with the hardware and systems software support that they received from HP. All interviews were performed by telephone, each lasting approximately 20 minutes. INPUT targeted data processing managers and computer operations managers as respondents. The sample was evenly distributed geographically and by industry, except for a slight preponderence of process manufacturers (32% of the sample).

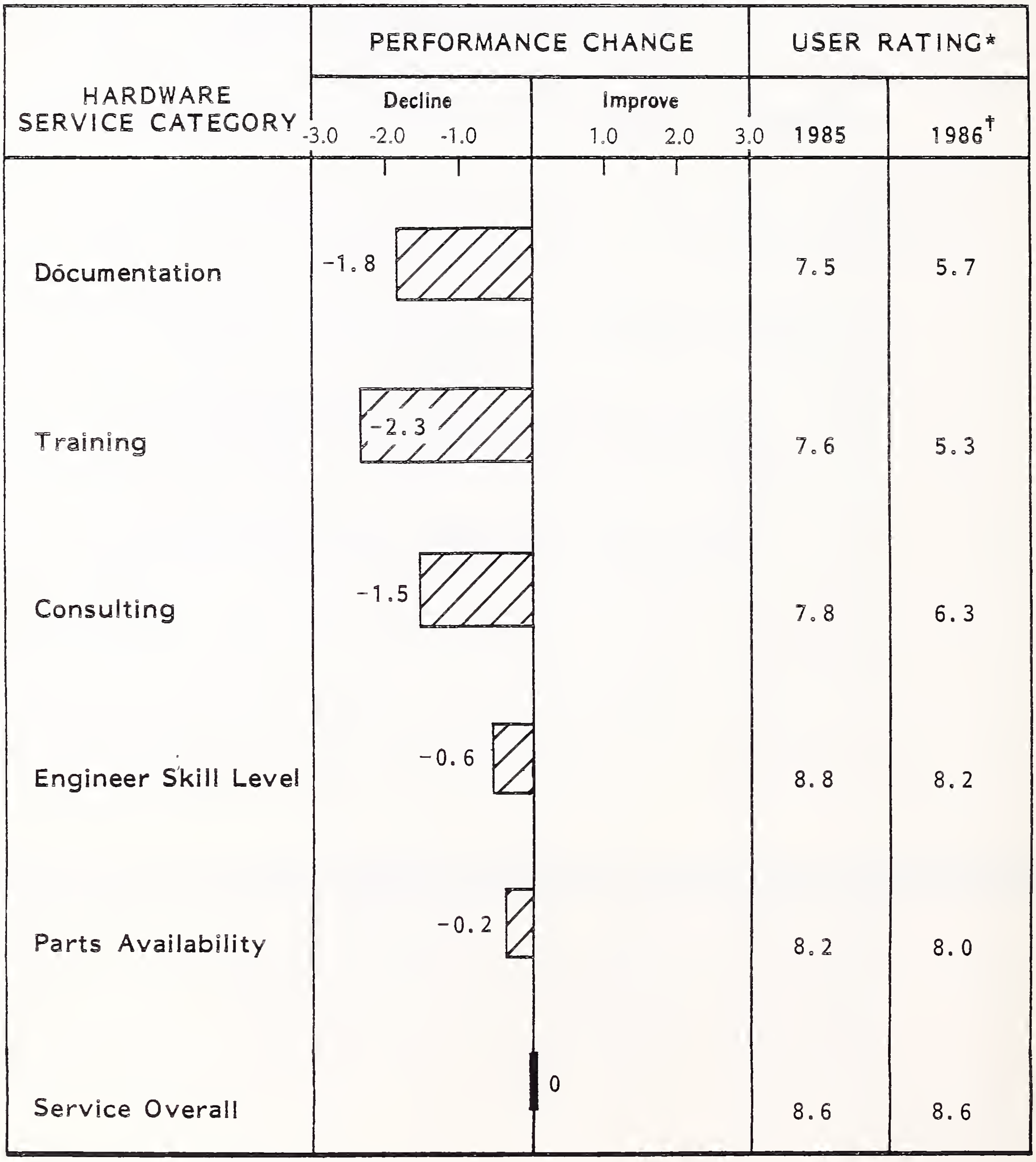
- Exhibit III-A-1 suggests that HP user ratings have declined from 1985 to 1986, implying that HP service performance has also declined. While this may be true to a certain extent, it must be emphasized that last year's HP sample reported that HP provided service at levels far exceeding the users' requirement levels. Thus, it is not incongruous that user satisfaction levels with HP support are still quite high, as demonstrated in Exhibit III-A-2. In fact, with the possible exception of hardware FE skill level, HP has correctly identified and satisfied the requirements of their users in all areas without placing too much emphasis on any one area. This is further demonstrated in Exhibit III-A-3, which shows that HP satisfies a majority of their users in all of the components analyzed. While the percentage of users satisfied in particular service areas may have declined from 1985 to 1986, it should be noted that user service requirements in the minicomputer and superminicomputer markets in which HP competes have risen dramatically, and that HP has done well to continue to satisfy the increasing support needs of their users.

- Special mention should be made of the significance of properly identifying the service needs of users. Over the past three years, INPUT has attempted to demonstrate the importance of correctly identifying, measuring, and then satisfying user requirements for both low- and high-priority services in such manner that does not ignore certain unmet needs in some areas while "over-providing" in other areas. Instead, the goal should be to provide the correct

EXHIBIT III-A-1

HARDWARE SERVICE PERFORMANCE, 1985-1986

HEWLETT-PACKARD



HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING* 1985	USER RATING* 1986†
Documentation	-1.8	7.5	5.7
Training	-2.3	7.6	5.3
Consulting	-1.5	7.8	6.3
Engineer Skill Level	-0.6	8.8	8.2
Parts Availability	-0.2	8.2	8.0
Service Overall	0	8.6	8.6

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.3

EXHIBIT III-A-2

1986 USER HARDWARE SERVICE RATINGS
HEWLETT-PACKARD

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	5.3	5.7	0.4
Training	4.9	5.3	0.4
Consulting	6.1	6.3	0.2
Remote Support	6.5	7.1	0.6
Engineer Skill Level	▨ 8.9	▨ 8.2	▨ (0.7)
Parts Availability	▨ 8.3	▨ 8.0	▨ (0.3)
Hardware Service Overall	8.6	8.6	0.0

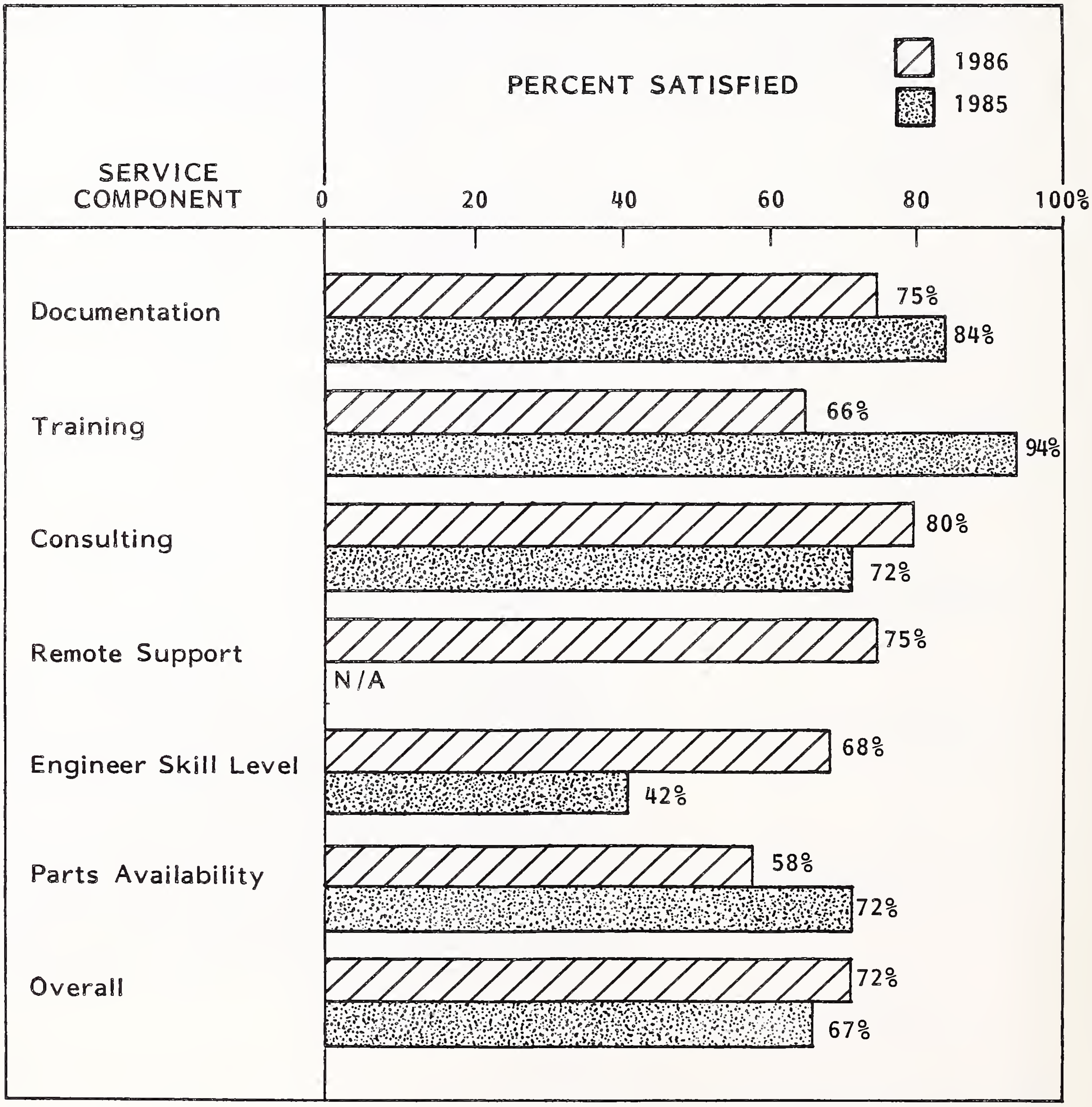
▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-A-3

USER SATISFACTION: HARDWARE SERVICE
HEWLETT-PACKARD



amount of service in all areas. Exhibit III-A-4 shows that HP has successfully met essentially all of their users' needs in the area of hardware maintenance and support without over-emphasizing (and over-spending on) any single service.

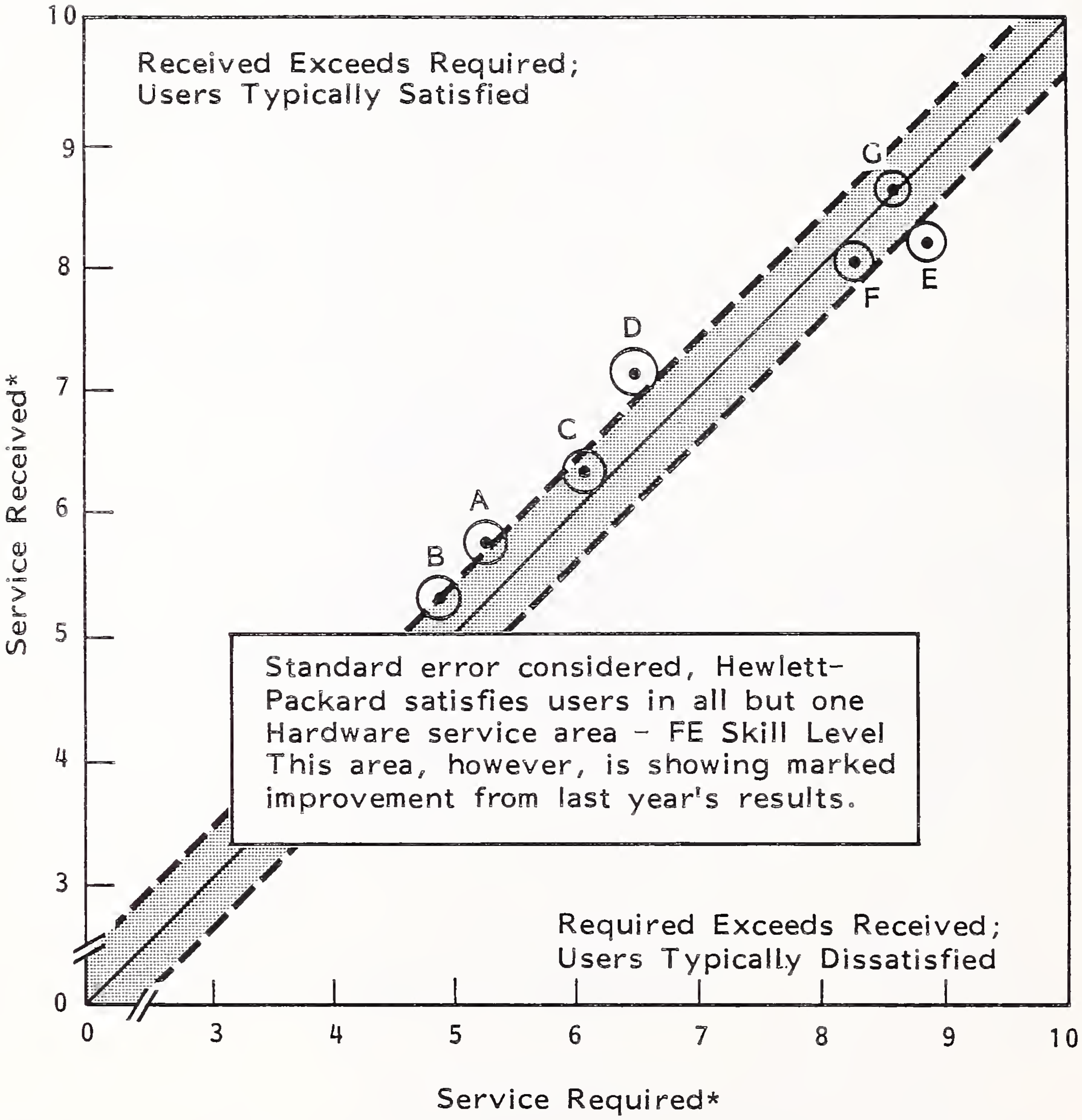
- HP has been somewhat less successful in the area of systems software support. Exhibit III-A-5 indicates that HP's users report that systems software support is slipping, particularly in the area of training. While Exhibit III-A-6 suggests that HP meets the average service requirement level for training (taking standard errors into account). Exhibit III-A-7 indicates that the percentage of users who receive a satisfactory level of service dropped from 53% in 1985 to 47% in 1986. A promising sign is the dramatic improvement in the area of documentation, with 41% of the HP sample satisfied versus only 18% in 1985. Exhibit III-A-8 graphically represents HP user satisfaction with systems software support.

- The success that HP has had in satisfying their users' service and support needs, particularly in the hardware areas, has spilled over into user satisfaction as measured by more traditional standards of service performance. Exhibit III-A-9 demonstrates that HP users report exceptionally high system availability actuals, indeed improved over last year's marks, even though the average number of interruptions stayed the same and total turnaround time for problem resolution has increased significantly. In this area, HP benefits from their users' rather low requirements for response and repair times, and since HP successfully exceeds their users' needs in these areas, as indicated in Exhibit III-A-10, user satisfaction with system availability also stays high. HP also benefits from a well-deserved reputation for reliable equipment, which is reflected in the ratings.

- Considering the rapidly increasing service requirements of superminicomputer users, it is surprising that HP users, along with those of Gould, DEC, and Concurrent, to name a few, are not more interested in increasing their own involvement in service. Perhaps this is a result of the increased use of these

EXHIBIT III-A-4

HARDWARE SERVICES REQUIRED/RECEIVED
HEWLETT-PACKARD



Standard error considered, Hewlett-Packard satisfies users in all but one Hardware service area - FE Skill Level This area, however, is showing marked improvement from last year's results.

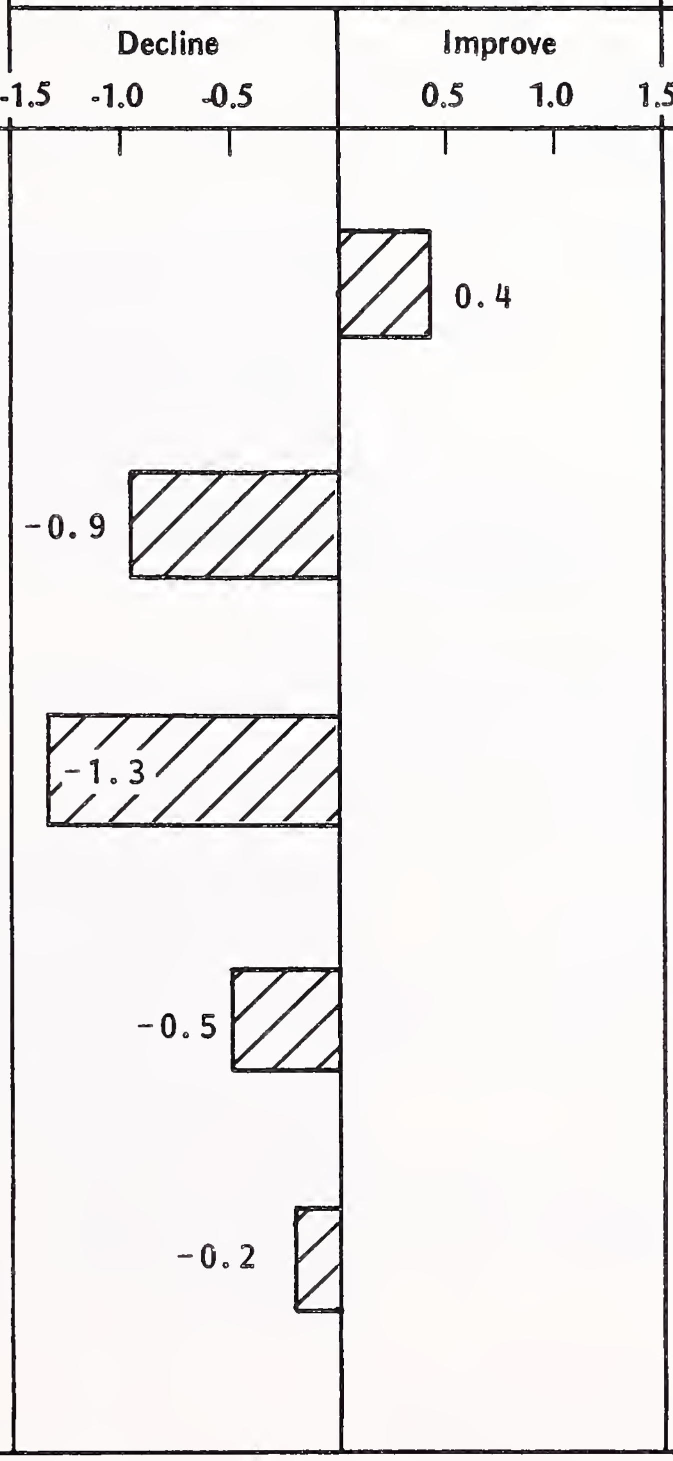
A = Documentation
B = Training
C = Consulting
D = Remote Support

E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-A-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
HEWLETT-PACKARD



SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING*	
		1985	1986†
Documentation	0.4	7.1	7.5
Training	-0.9	7.6	6.7
Consulting	-1.3	7.6	6.3
Engineer Skill Level	-0.5	7.8	7.3
Service Overall	-0.2	7.9	7.7

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.6

EXHIBIT III-A-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
HEWLETT-PACKARD

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	8.6	7.5	(1.1)
Training	6.8	6.7	(0.1)
Consulting	6.1	6.3	0.2
Remote Support	6.6	5.9	(0.7)
Engineer Skill Level	8.1	7.3	(0.8)
Service Overall	8.1	7.7	(0.4)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.3

EXHIBIT III-A-7

USER SATISFACTION: SOFTWARE SERVICE
HEWLETT-PACKARD

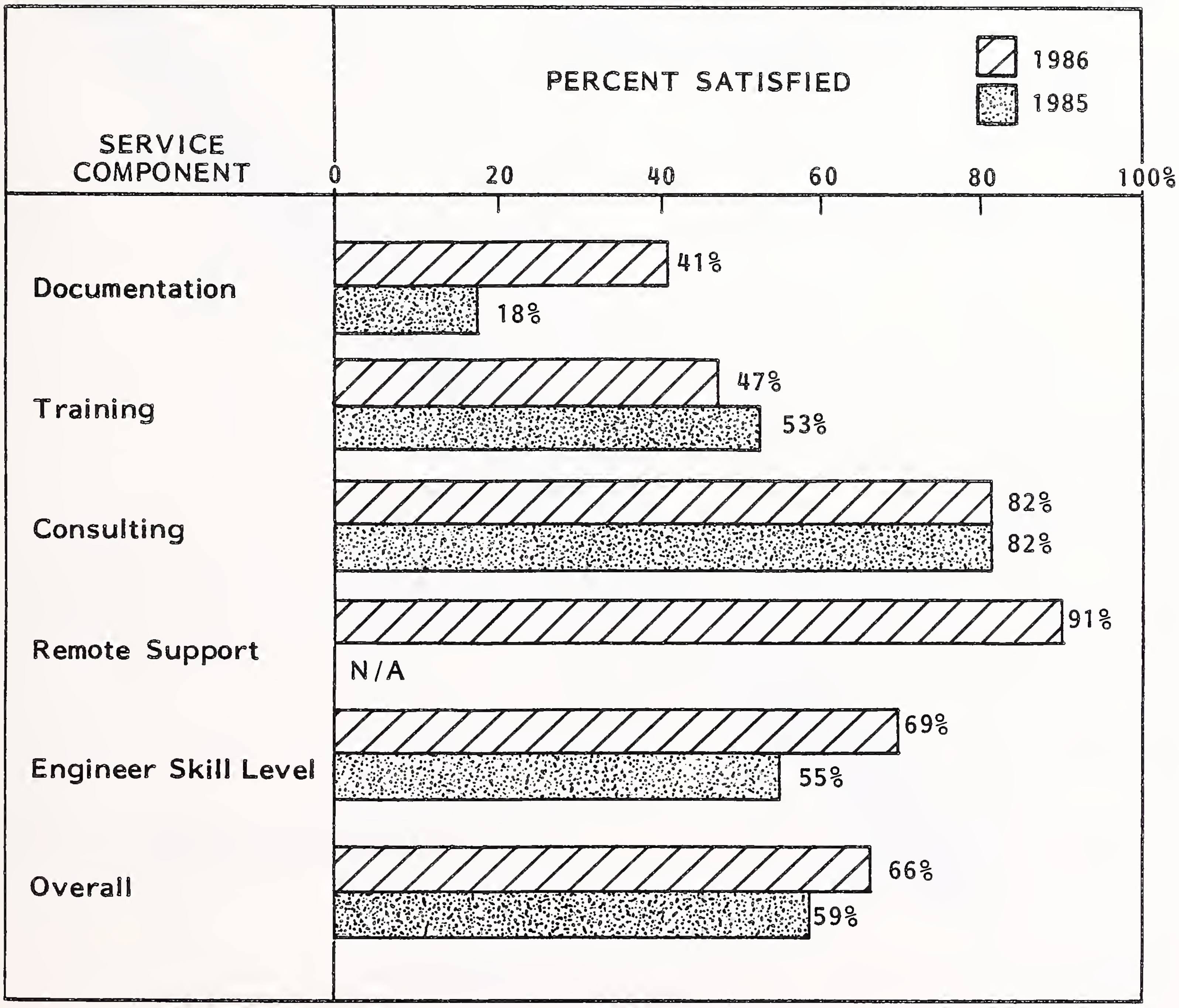
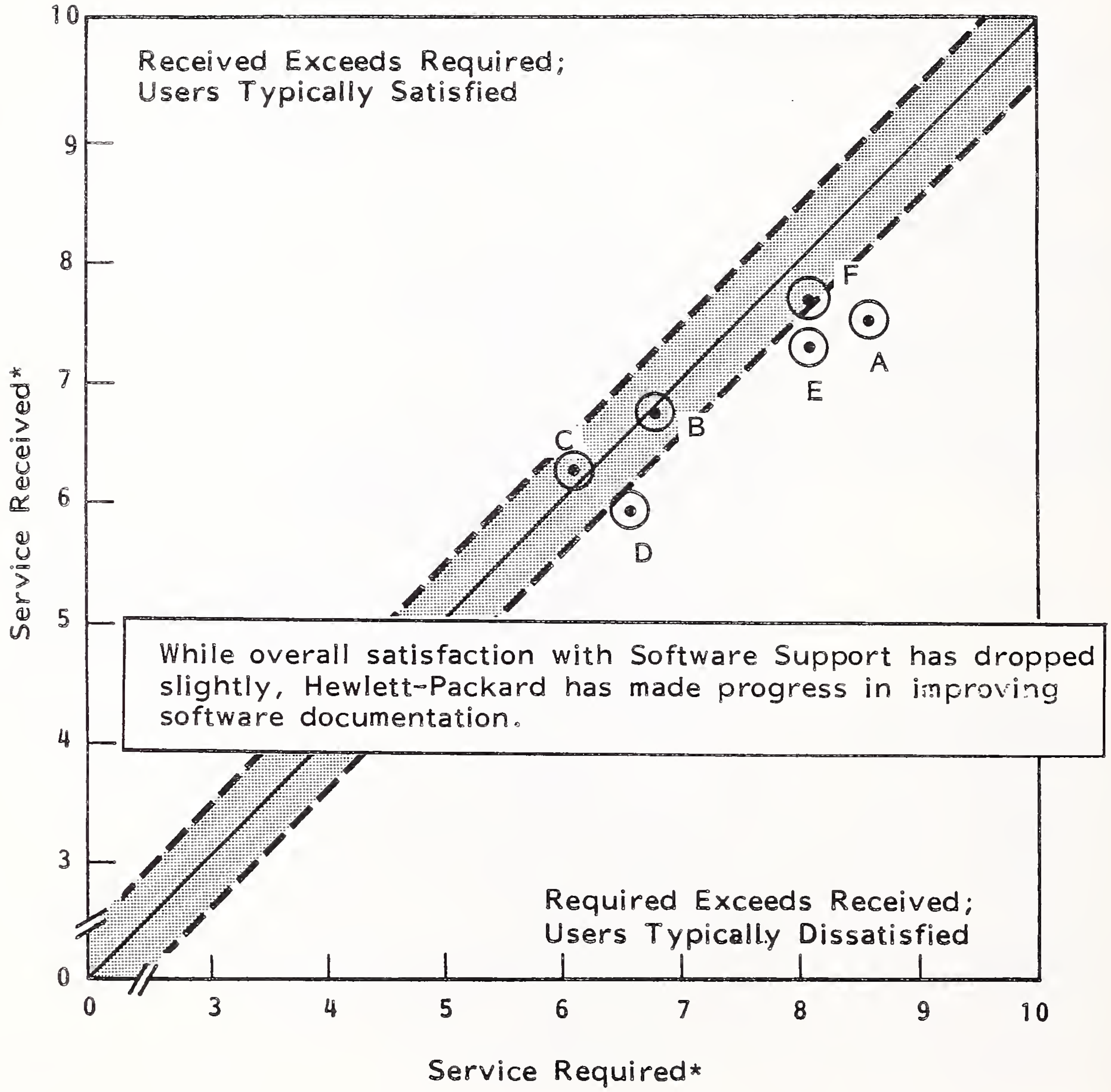


EXHIBIT III-A-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
HEWLETT-PACKARD



While overall satisfaction with Software Support has dropped slightly, Hewlett-Packard has made progress in improving software documentation.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-A-9

SERVICE PERFORMANCE
HEWLETT-PACKARD

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	96.8%	98.0%
Average Number of Interruptions		
Per Month (Number)	1.1	1.0
Percent Hardware Caused	75.5%	65.0%
Percent Software Caused	24.4%	26.8%
Average Hardware Response Time (Hours)	4.3 hr.	5.8 hr.
Average Hardware Repair Time (Hours)	3.0 hr.	8.0 hr.
Average Systems Software Response Time (Hours)	3.0 hr.	7.4 hr.
Average Systems Software Repair Time (Hours)	9.4 hr.	*

* Insufficient Response

EXHIBIT III-A-10

USER EXPECTATIONS FOR SERVICE PERFORMANCE
HEWLETT-PACKARD

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent) Falls Short of Expectations	VENDOR PERFORMANCE (Percent) Exceeds Expectations
System Availability (Percent)	97.2%		1.0%
Hardware Response Time (Hours)	5.8 hr.		48%
Hardware Repair Time (Hours)	8.0 hr.		53%
Systems Software Response Time (Hours)	7.4 hr.		41%
Systems Software Repair Time (Hours)	*	0	0

* Insufficient Response

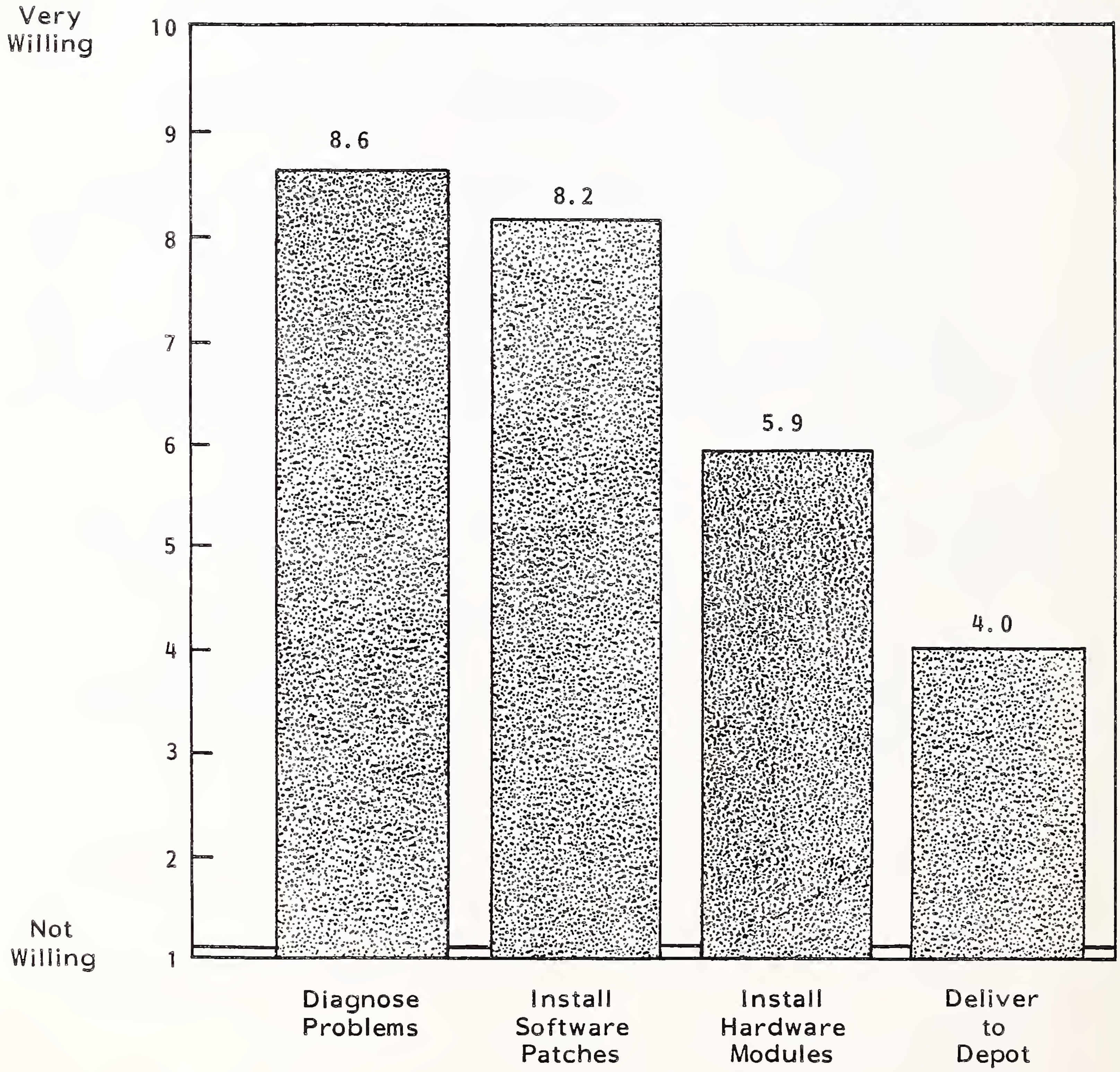
computers by engineering staff, rather than data processing personnel that encourages users to prefer manufacturer-supplied service. Exhibit III-A-11 shows that HP users are relatively interested in phone support; however, they are much less interested than users of large systems who rate their willingness in the 9.0+ range.

- This preference for vendor-supplied service, along with HP's ability to satisfy their users' needs, has also helped limit TPM penetration into HP user sites, even though the large installed base of HP 3000s is an attractive market for TPM. While some TPMs have claimed that HP has gone too far in limiting TPM activity (most notably Datagate of Santa Clara, CA), HP has benefitted from an extremely loyal user base, as demonstrated in Exhibit III-A-12.

- Exhibit III-A-13 presents HP user attitudes toward premium services. As one might suspect, there is rather limited opportunity for additional service offerings at HP since HP offers one of the most extensive service menus in the business. It is apparent that the high system availability requirements of HP's users attract them to services that reduce the need to provide remedial maintenance, services such as remote support and increased preventive maintenance.

EXHIBIT III-A-11

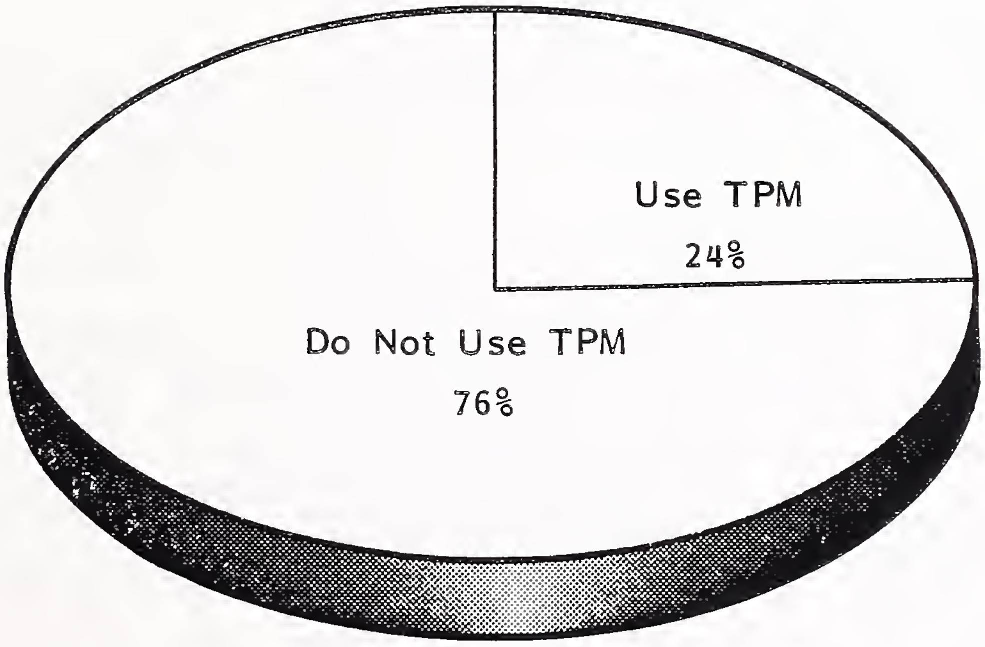
USER WILLINGNESS TO PERFORM MAINTENANCE
HEWLETT-PACKARD



* Average Standard Error: 0.2

EXHIBIT III-A-12

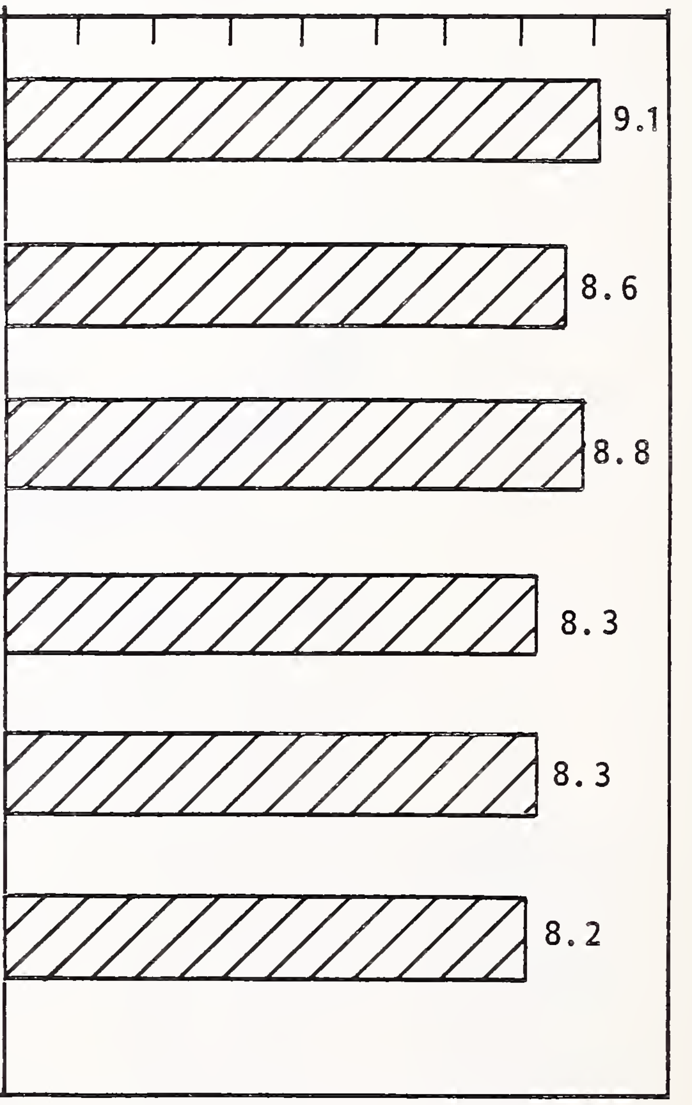
CURRENT TPM USE
HEWLETT-PACKARD



Hewlett-Packard's reputation for quality equipment, coupled with their extensive service menu, provides Hewlett-Packard with a loyal user base.

EXHIBIT III-A-13

USER REQUIREMENTS FOR EXTENDED SERVICES
HEWLETT-PACKARD



SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT*
Standby Coverage	36%	9.1
Remote Diagnostics	64	8.6
Preventive Maintenance during Non-Prime Hours	64	8.8
Deferred Response	36	8.3
Under Two-Hour Response	28	8.3
Maintenance Management	36	8.2

*Average Standard Error: 0.4

III B. DIGITAL EQUIPMENT CORPORATION

- INPUT interviewed 25 DEC PDP 11/70 users in the months of April and May 1986, attempting to measure DEC's ability to satisfy the hardware maintenance and systems software support needs of their users. All interviews were conducted by telephone, each lasting approximately 20 minutes. INPUT targeted managers of data processing as respondents. The industry breakdown of the DEC minicomputer sample is weighted by business services companies (40% of the DEC sample) and discrete manufacturers (24% of the sample). Other industries represented include education, process manufacturing, and wholesale distribution.

- Exhibit III-B-1 indicates that while DEC's performance in lower priority services improved over the last year, performance in higher priority services, such as FE skill level, spare parts availability, and overall satisfaction, dropped from 1985 to 1986. Not surprisingly, DEC user needs in these areas went unmet in 1986, as shown in Exhibit III-B-2. Most critical of these problem areas appears to be spare parts availability, which satisfies only 24% of the DEC PDP 11/70 sample, as shown in Exhibit III-B-3. What is surprising is the low percentage of DEC users who are satisfied with hardware training, since DEC is well known for their considerable catalog of training courses available to end users. This suggests that few users take advantage of these courses, either due to costs involved or a low perception of the value of additional training.

- Exhibit III-B-4 indicates that DEC users clearly segment hardware services into low priority (documentation, training, and consulting) and high priority (engineer skill level, parts availability, and hardware service overall) groupings. Equally clear is that DEC exceeds the "received" requirement of the low priority group and misses the mark on the high priority group. This does not suggest that DEC should ignore the low priority needs of their users, although a certain redirection of effort is recommended. Rather, DEC needs

EXHIBIT III-B-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
DEC

HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE Decline -2.0 -1.0 -0.5 / Improve 0.5 1.0 2.0	USER RATING* 1985	USER RATING* 1986†
Documentation	1.0	6.9	7.9
Training	2.0	4.9	6.8
Consulting	0.3	6.9	7.2
Engineer Skill Level	-0.6	8.2	7.6
Parts Availability	-0.6	7.5	6.9
Service Overall	-0.6	8.4	7.8

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-B-2

1986 USER HARDWARE SERVICE RATINGS
DEC

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	5.8	7.9	2.1
Training	4.4	6.8	2.4
Consulting	5.4	7.2	1.8
Remote Support	7.2	7.4	0.2
Engineer Skill Level	▨ 8.9	▨ 7.6	▨ (1.3)
Parts Availability	▨ 8.9	▨ 6.9	▨ (2.0)
Hardware Service Overall	▨ 8.7	▨ 7.8	▨ (0.9)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-B-3

USER SATISFACTION: HARDWARE SERVICE
DEC

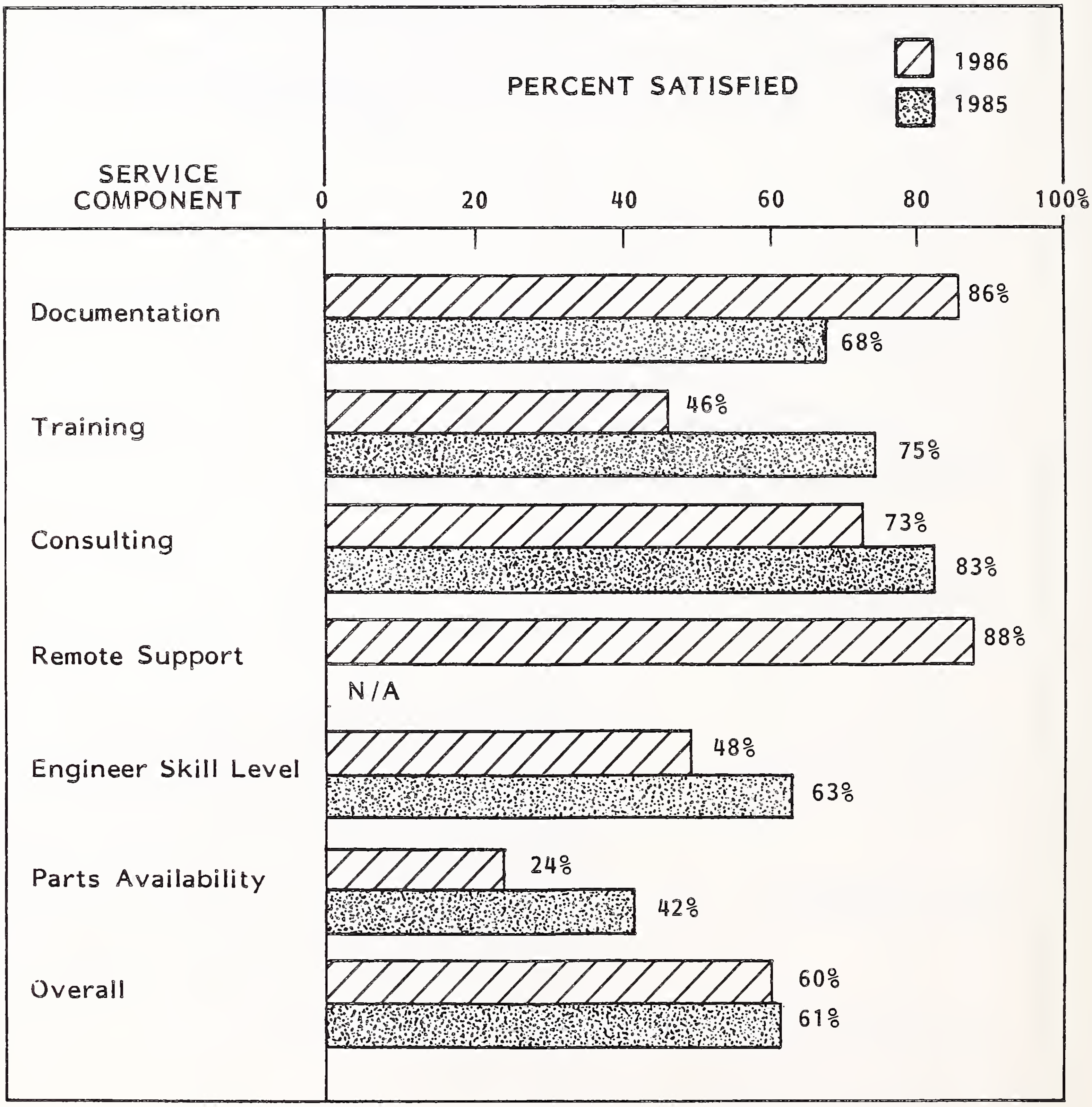
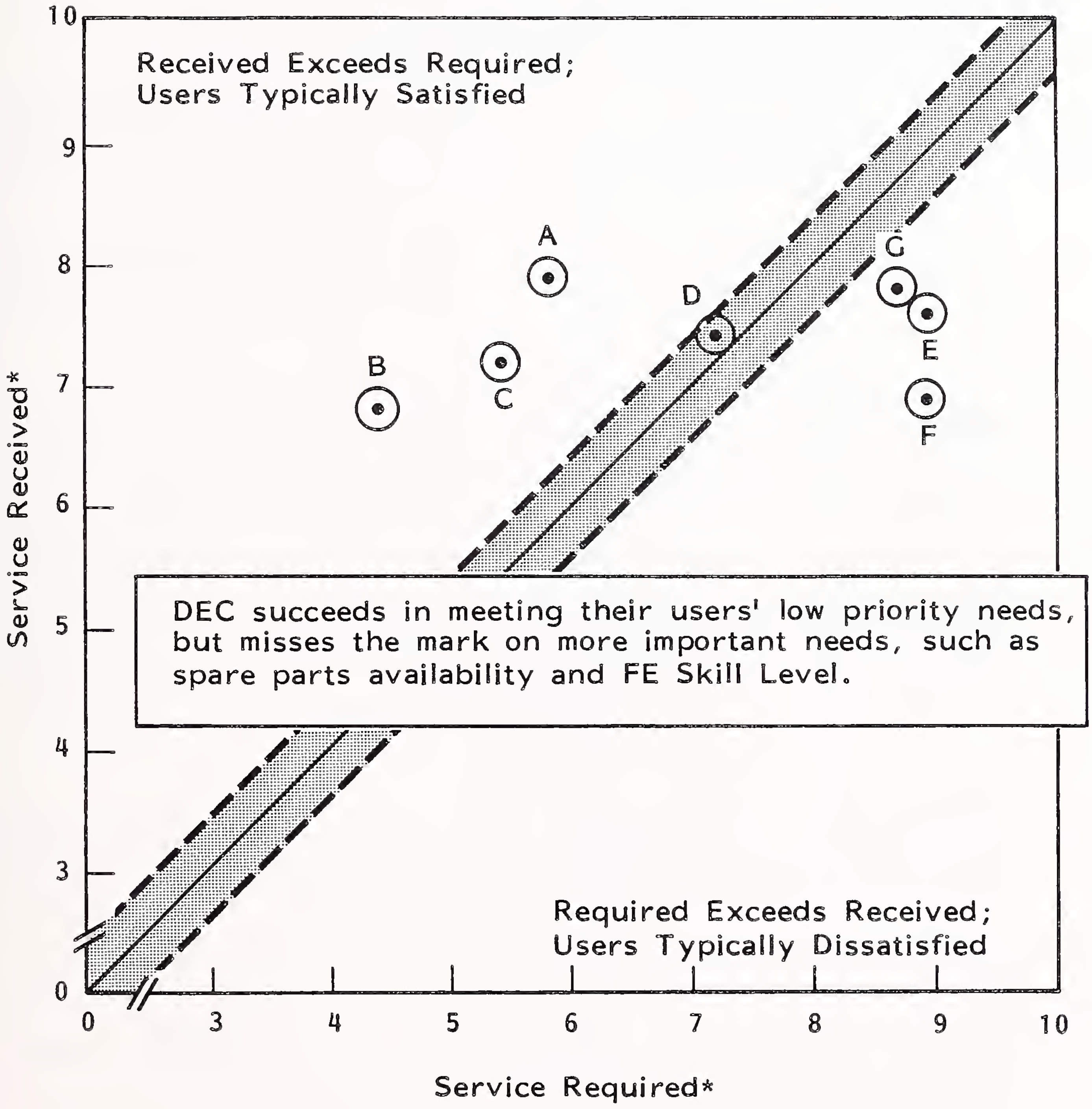


EXHIBIT III-B-4

HARDWARE SERVICES REQUIRED/RECEIVED
DEC



DEC succeeds in meeting their users' low priority needs, but misses the mark on more important needs, such as spare parts availability and FE Skill Level.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

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to increase their users' perception of the importance of these services, which will then increase the users' overall satisfaction with service.

- Exhibit III-B-5 indicates that DEC's performance in systems software support is fairly close to that of last year. More importantly, DEC's performance versus their users' requirements, shown in Exhibit III-B-6, needs improvement, as DEC succeeds in meeting user requirements in only one service area--software training. Moreover, DEC satisfies more than 50% of their users in only this one area, as shown in Exhibit III-B-7. While demonstrating significant improvement in the area of software engineer skill level, DEC fell back in documentation and overall satisfaction with software support. Exhibit III-B-8 graphically demonstrates the gap in software support from DEC.

- DEC performance slipped from 1985 to 1986, as demonstrated by more traditional measurements in Exhibit III-B-9. While system availability stayed about the same, whatever improvement there was in hardware reliability (as measured by the average number of interruptions per month) was offset by slower hardware response and repair times. (Software responsiveness is less important, since the vast majority of system interruptions were hardware related.) Luckily, DEC PDP 11/70 users are very accepting of this, as Exhibit III-B-10 shows these users as having very realistic goals in these areas.

- Exhibit III-B-11 indicates that DEC minicomputer users are relatively attracted to increasing their involvement in the diagnosis of system problems but would prefer that DEC provide the actual repairs. Surprisingly, less than one-fourth of our sample (shown in Exhibit III-B-12) was experienced with third-party maintenance. DEC has been a traditional market for TPM, and one would expect a much larger portion of the sample would have some experience with TPM vendors, given the large number of "foreign" peripherals at DEC sites.

- Exhibit III-B-13 demonstrates the success that DEC has had in presenting a menu of premium services to their users since a much larger percentage of their user sample is attracted to these premium services than most of the other vendors' samples.

EXHIBIT III-B-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
DEC

SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE (Decline -1.5 -1.0 -0.5 / Improve 0.5 1.0 1.5)	USER RATING*	
		1985	1986†
Documentation	-0.1	7.5	7.4
Training	0.1	7.0	7.1
Consulting	-0.4	5.7	5.3
Engineer Skill Level	0.3	6.1	6.4
Service Overall	-0.2	7.1	6.9

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-B-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
DEC

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	▨ 8.5	▨ 7.4	▨ (1.1)
Training	6.7	7.1	0.4
Consulting	▨ 6.1	▨ 5.3	▨ (0.8)
Remote Support	▨ 8.4	▨ 6.8	▨ (1.6)
Engineer Skill Level	▨ 8.9	▨ 6.4	▨ (2.5)
Service Overall	▨ 8.6	▨ 6.9	▨ (1.7)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-B-7

USER SATISFACTION: SOFTWARE SERVICE
DEC

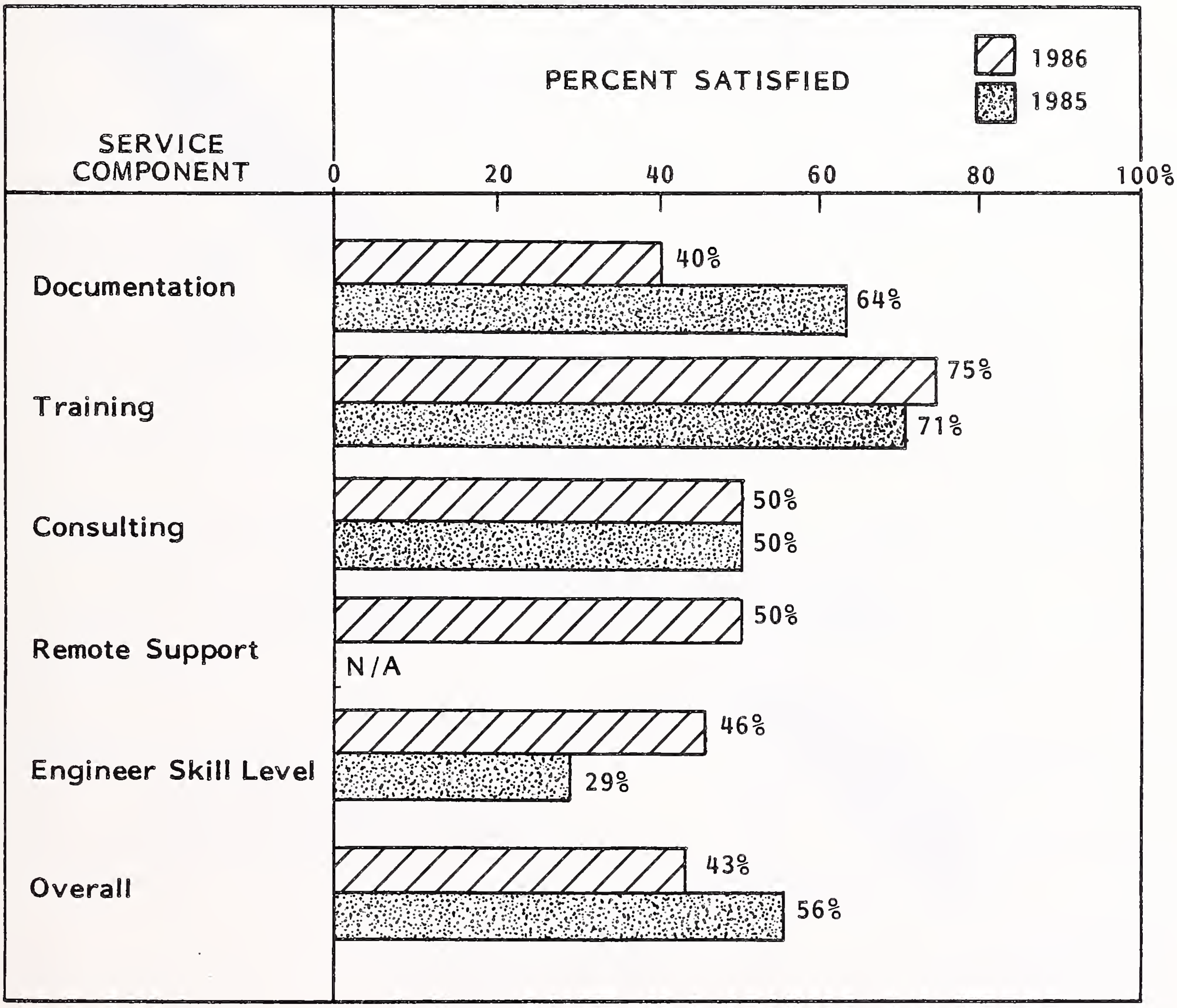
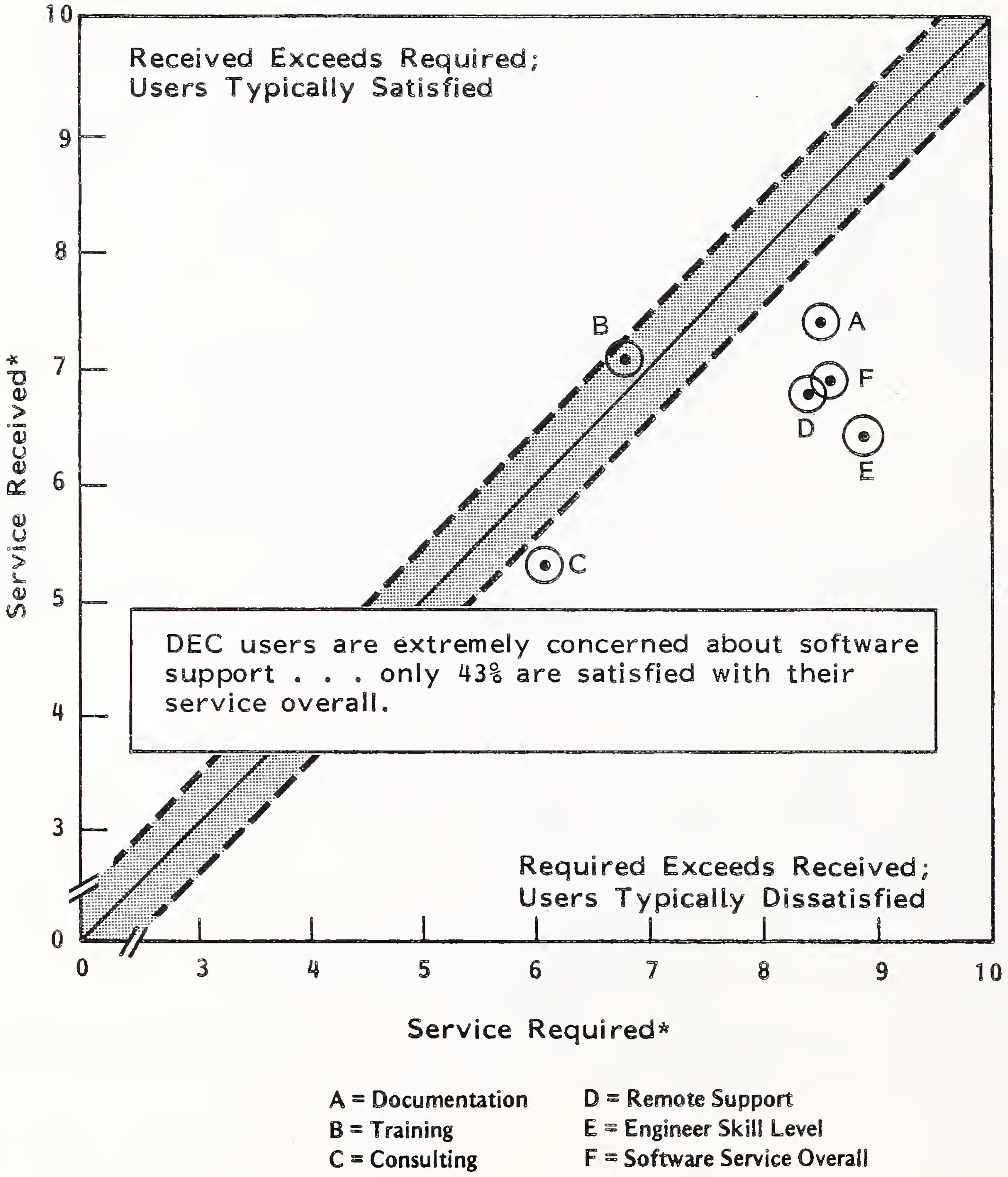


EXHIBIT III-B-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
DEC



DEC users are extremely concerned about software support . . . only 43% are satisfied with their service overall.

* Rating: 1 = Low, 10 = High

EXHIBIT III-B-9

SERVICE PERFORMANCE
DEC

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	95.7%	95.4%
Average Number of Interruptions		
Per Month (Number)	1.6	1.4
Percent Hardware Caused	82.0%	92.0%
Percent Software Caused	18.0%	8.0%
Average Hardware Response Time (Hours)	2.5 hr.	5.8 hr.
Average Hardware Repair Time (Hours)	3.7 hr.	7.7 hr.
Average Systems Software Response Time (Hours)	4.3 hr.	7.8 hr.
Average Systems Software Repair Time (Hours)	13.4 hr.	6.8 hr.

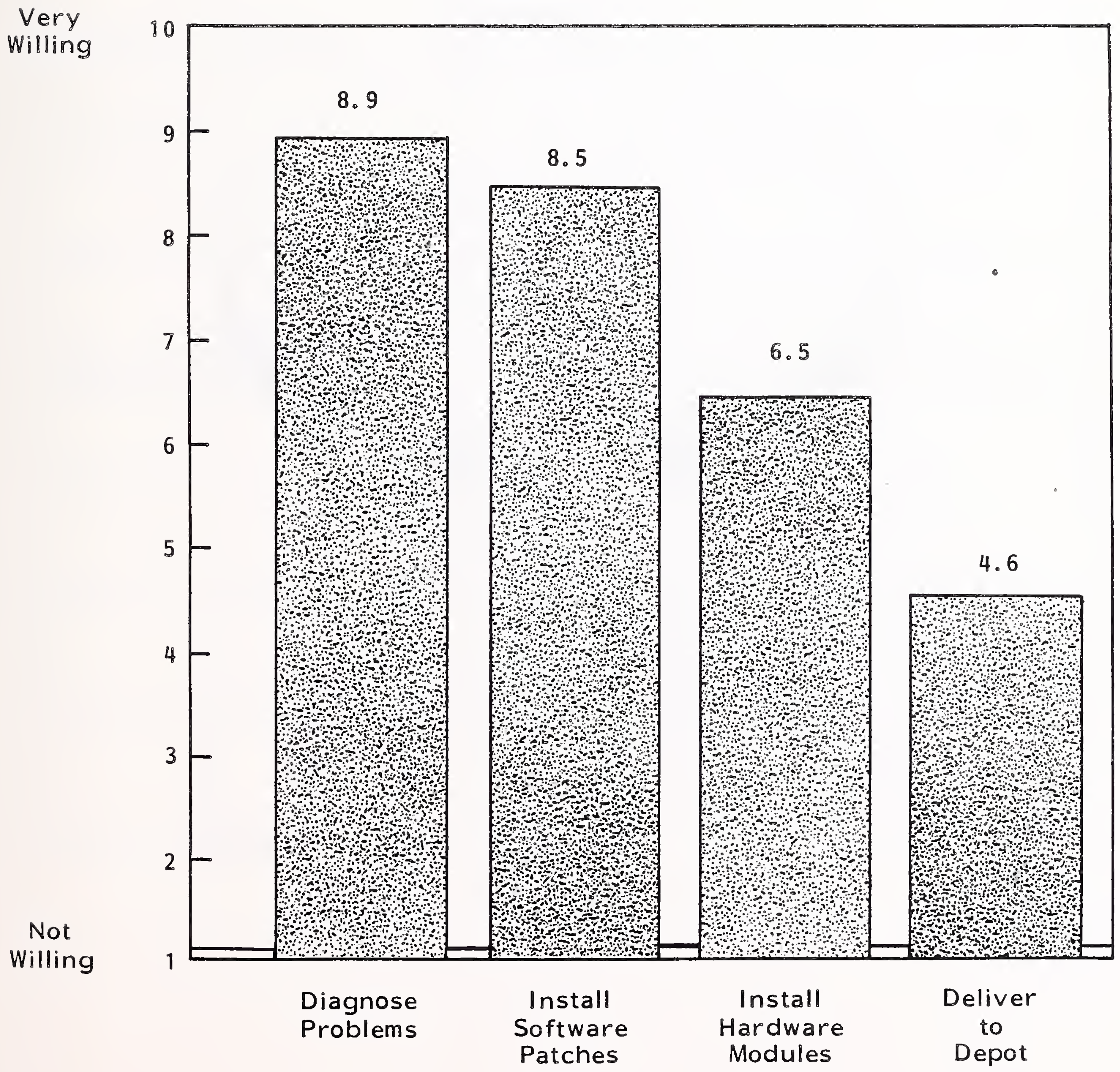
EXHIBIT III-B-10

USER EXPECTATIONS FOR SERVICE PERFORMANCE
DEC

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent)	
		Falls Short of Expectations	Exceeds Expectations
		60% 45 30 15	15 30 45 60%
System Availability (Percent)	96.5%	-1.2%	
Hardware Response Time (Hours)	7.6 hr.		24%
Hardware Repair Time (Hours)	11.0 hr		30%
Systems Software Response Time (Hours)	5.8 hr.	-34%	
Systems Software Repair Time (Hours)	4.4 hr.	-55%	

EXHIBIT III-B-11

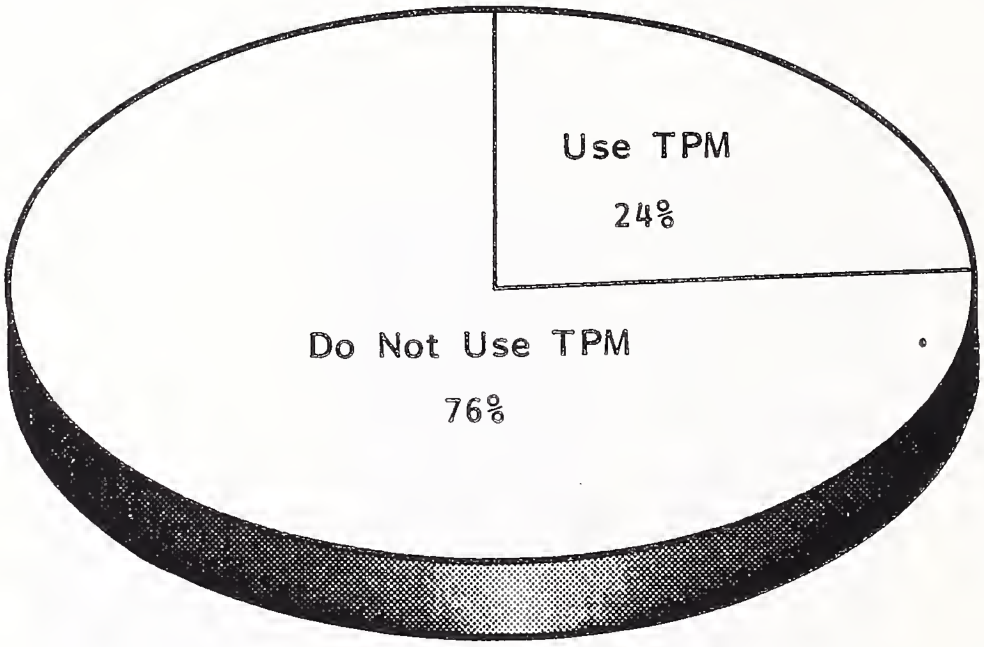
USER WILLINGNESS TO PERFORM MAINTENANCE
DEC



* Average Standard Error: 0.3

EXHIBIT III-B-12

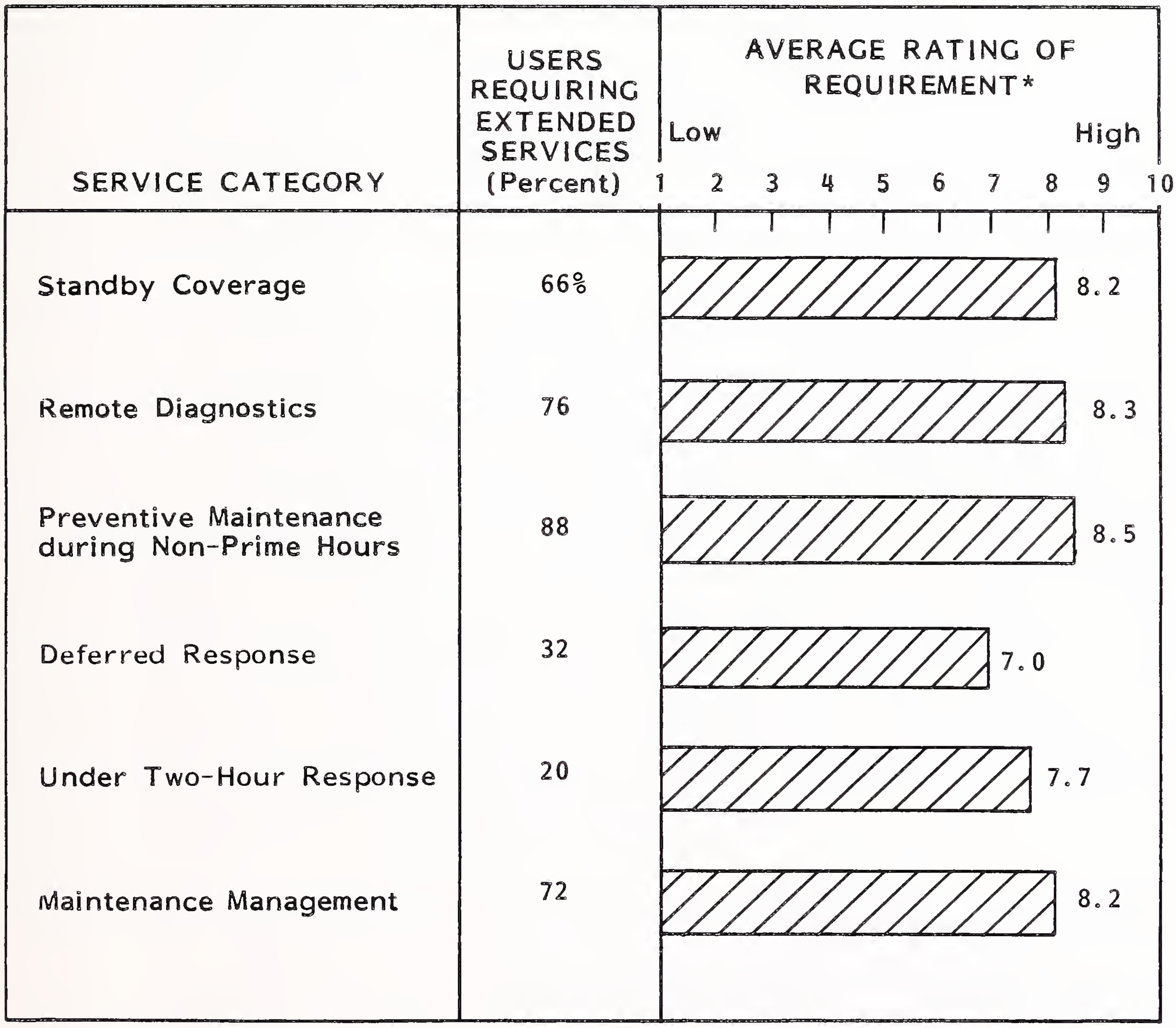
CURRENT TPM USE
DEC



A low percentage of the DEC PDP 11/70 sample is experienced with TPM, surprising since DEC has been a traditional market for TPM.

EXHIBIT III-B-13

USER REQUIREMENTS FOR EXTENDED SERVICES
DEC



SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT*
Standby Coverage	66%	8.2
Remote Diagnostics	76	8.3
Preventive Maintenance during Non-Prime Hours	88	8.5
Deferred Response	32	7.0
Under Two-Hour Response	20	7.7
Maintenance Management	72	8.2

*Average Standard Error: 0.3

III C. INTERNATIONAL BUSINESS MACHINES

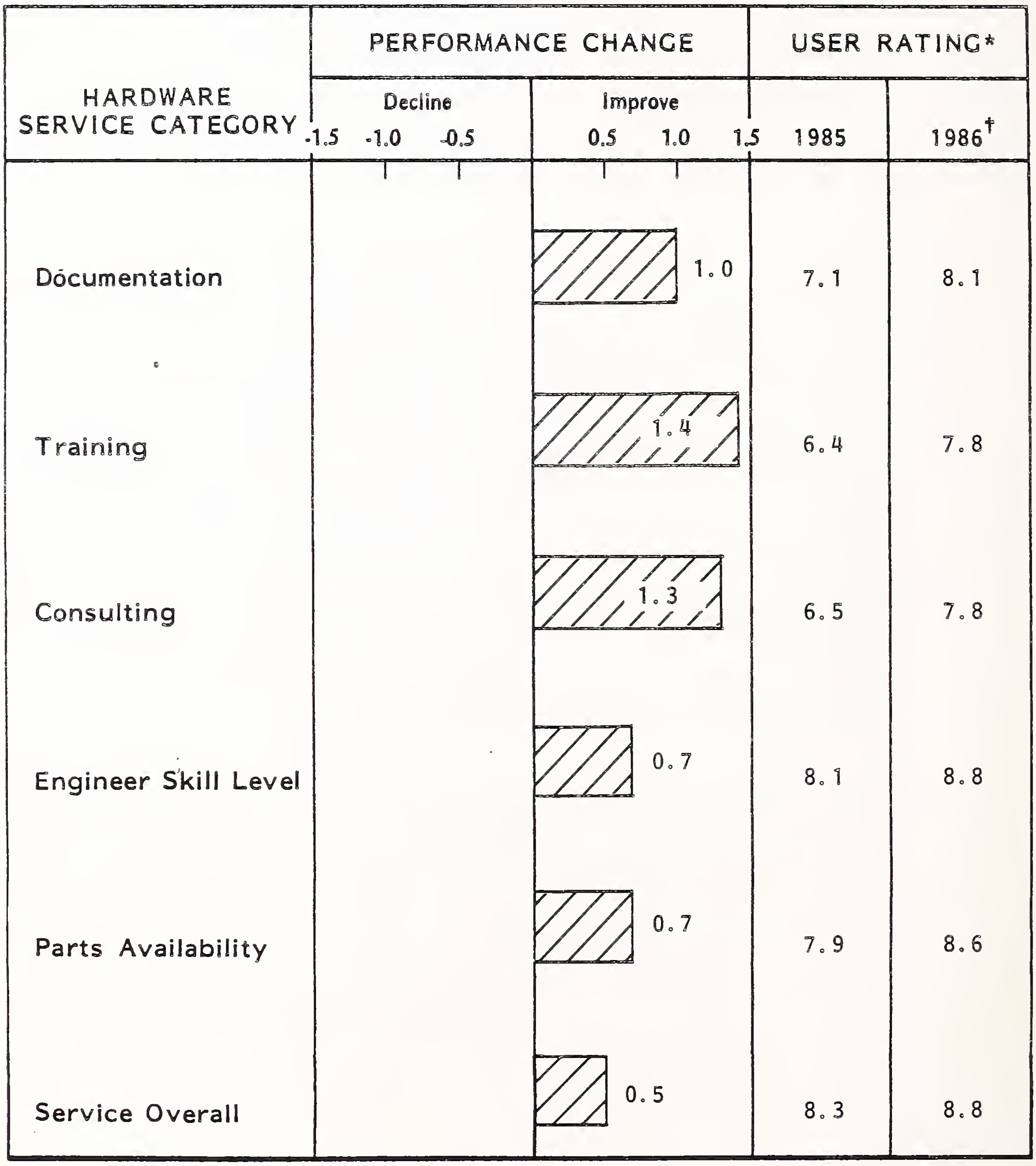
- INPUT interviewed 25 IBM System 36 users in the month of May concerning their satisfaction with the hardware maintenance and software support that they received. All interviews were performed by telephone and each lasted approximately 20 minutes. INPUT targeted data processing and computer operations managers as respondents. While the IBM minicomputer sample was dispersed over a number of industries, the sample was slightly weighted toward services companies (with 24% of the sample), wholesale distribution (20%), process manufacturing (16%), and discrete manufacturing (12%).

- Exhibit III-C-1 indicates that IBM hardware service improved in all areas from 1985 to 1986. The greatest improvement occurred in the areas of documentation, consulting, and training. System 36 users are more segmented in their perception of service than other IBM users, as shown in Exhibit III-C-2, and, as a result, IBM's service performance is less consistent than in the mainframe or superminicomputer markets. For example, while IBM succeeds in satisfying a majority of their users' requirements in every hardware service component analyzed in Exhibit III-C-3, there appears to be a much greater segmentation of the importance and satisfaction of services provided in this user sample. This segmentation is also shown in Exhibit III-C-4, which demonstrates the greater perception of importance that users associate with FE skill level, parts availability, and hardware service overall.

- While Exhibit III-C-5 indicates that IBM's systems software support performance improved in all categories analyzed, System 36 user expectations for service increased at an even faster rate. Exhibit III-C-6 demonstrates that these users have relatively high requirements for most of the service components measured, especially software engineer skill level and software service overall. As a result, System 36 user satisfaction remains low, as shown in Exhibit III-C-7, even lower than 1985 in the key areas of engineer skill level and overall satisfaction. Exhibit III-C-8 graphically demonstrates

EXHIBIT III-C-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
IBM



HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING* 1985	USER RATING* 1986†
Documentation	1.0	7.1	8.1
Training	1.4	6.4	7.8
Consulting	1.3	6.5	7.8
Engineer Skill Level	0.7	8.1	8.8
Parts Availability	0.7	7.9	8.6
Service Overall	0.5	8.3	8.8

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-C-2

1986 USER HARDWARE SERVICE RATINGS
IBM

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE* Required†	LEVEL OF SERVICE* Received†	SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
Documentation	5.8	8.0	2.2
Training	7.2	7.8	0.6
Consulting	6.0	7.8	1.8
Remote Support	5.2	7.6	2.4
Engineer Skill Level	▨ 9.0	▨ 8.8	▨ (0.2)
Parts Availability	▨ 9.6	▨ 8.6	▨ (1.0)
Hardware Service Overall	▨ 9.5	▨ 8.8	▨ (0.7)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-C-3

USER SATISFACTION: HARDWARE SERVICE
IBM

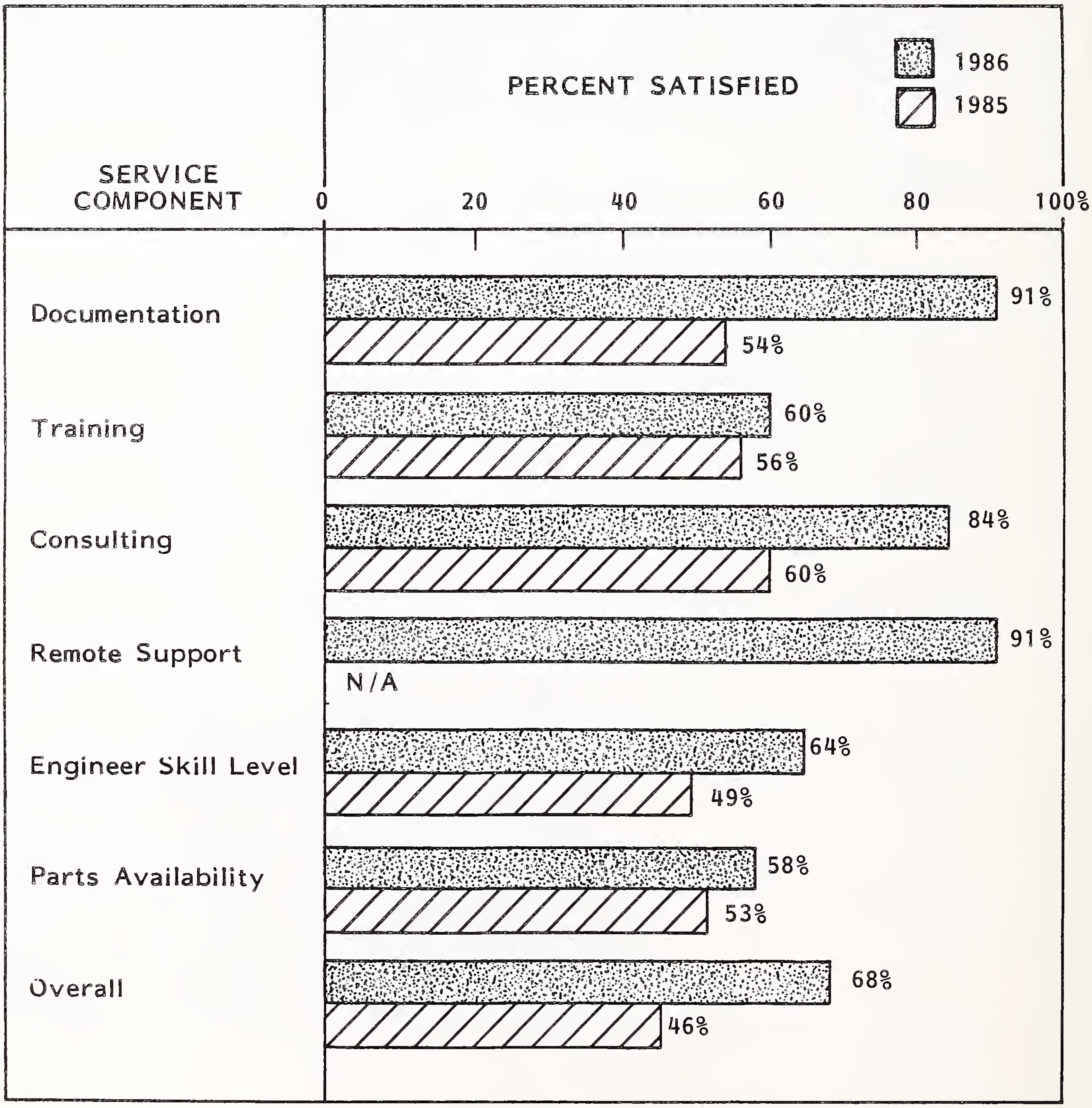
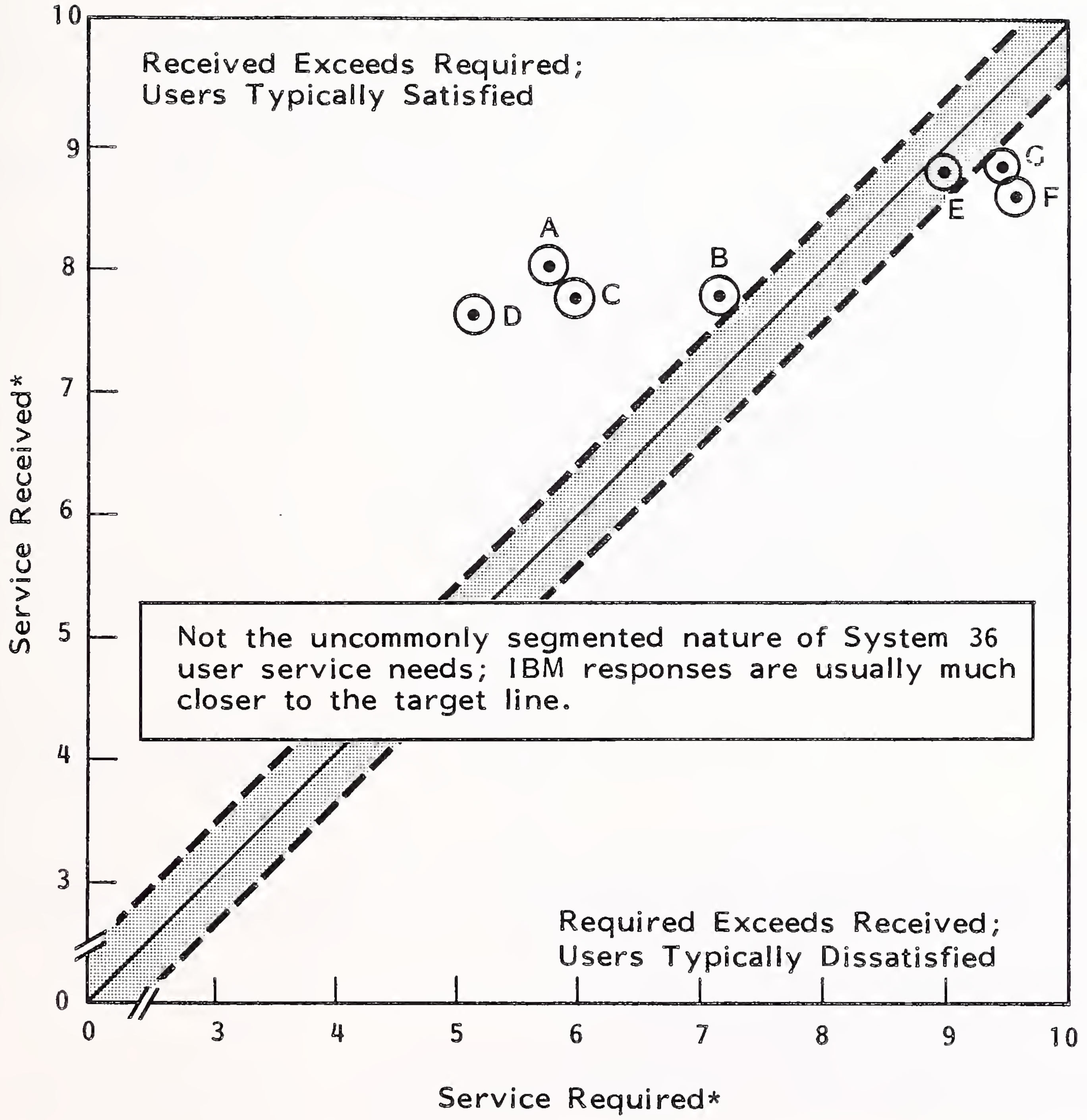


EXHIBIT III-C-4

HARDWARE SERVICES REQUIRED/RECEIVED
IBM



Not the uncommonly segmented nature of System 36 user service needs; IBM responses are usually much closer to the target line.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-C-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
IBM

SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE		USER RATING*	
	Decline -1.5 -1.0 -0.5	Improve 0.5 1.0 1.5	1985	1986†
Documentation		0.2	7.4	7.6
Training		0.4	6.4	6.8
Consulting		0.3	6.9	7.2
Engineer Skill Level		1.1	6.9	8.0
Service Overall		0.8	7.0	7.8

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-C-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
IBM

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	▨ 8.3	▨ 7.6	▨ (0.7)
Training	▨ 8.2	▨ 6.8	▨ (1.4)
Consulting	▨ 7.9	▨ 7.2	▨ (0.7)
Remote Support	5.3	7.5	2.2
Engineer Skill Level	▨ 9.0	▨ 8.0	▨ (1.0)
Service Overall	▨ 9.0	▨ 7.8	▨ (1.2)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-C-7

USER SATISFACTION: SOFTWARE SERVICE
IBM

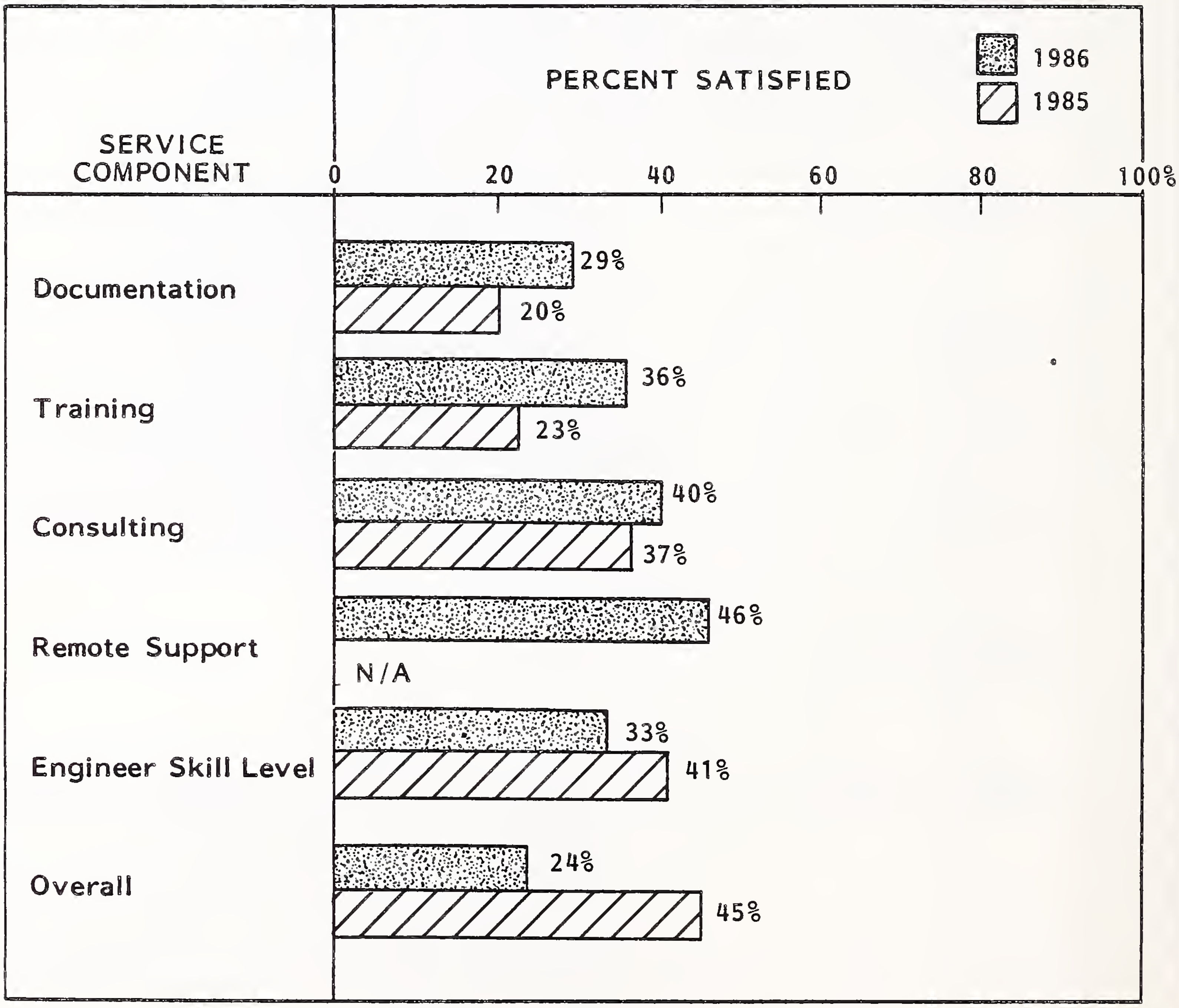
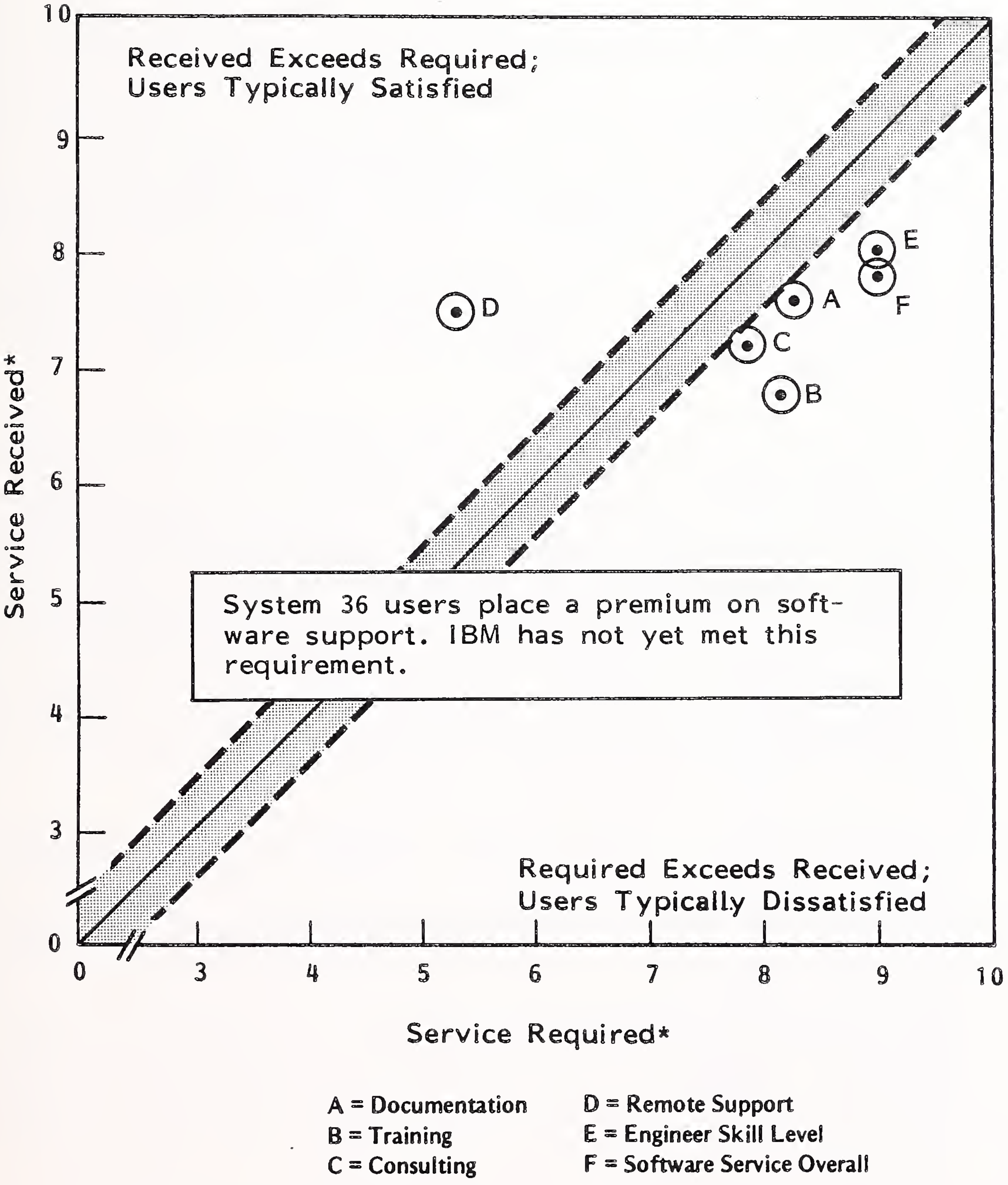


EXHIBIT III-C-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
IBM



System 36 users place a premium on software support. IBM has not yet met this requirement.

* Rating: 1 = Low, 10 = High

the gap between System 36 user requirements for systems software support and their current level of satisfaction.

- User dissatisfaction with IBM service is unusual. Perhaps much of the dissatisfaction is a reflection of user dissatisfaction with the System 36 itself, which has received mixed reviews from users initially attracted to the product as a departmental system (versus competitive products from Wang and HP). Users who upgraded from a System 34 probably were happier with this system, and also the support, due to the closeness of the two systems in design. However, other users have been concerned with the lack of processing "horse power" of the System 36, particularly in departmental processing applications, which undoubtedly has raised the demand on software applications and requirements for software support.

- Exhibit III-C-9 shows the System 36 as an extremely reliable machine, with over 99% system availability and less than one system interruption per month. Hardware responsiveness is faster than the users' requirements, but systems software support responsiveness is lacking, as shown in Exhibit III-C-10. And while user satisfaction with IBM hardware service tends to limit user willingness to perform (hardware-related) self-maintenance, it is interesting, but not surprising, that System 36 users are most willing to become involved in software support, as shown in Exhibit III-C-11.

- Exhibit III-C-12 shows that just under one-quarter of the System 36 sample is experienced with TPM--a high number for such a new product but not for an IBM site. TPM attraction to System 36 is quite high, and TPM penetration into this market can be expected to grow, particularly in distributed applications or those with non-IBM equipment attached. Exhibit III-C-13 hints that there are a number of such locations, given the large number of System 36 users who are attracted to the maintenance management (single-source) concept.

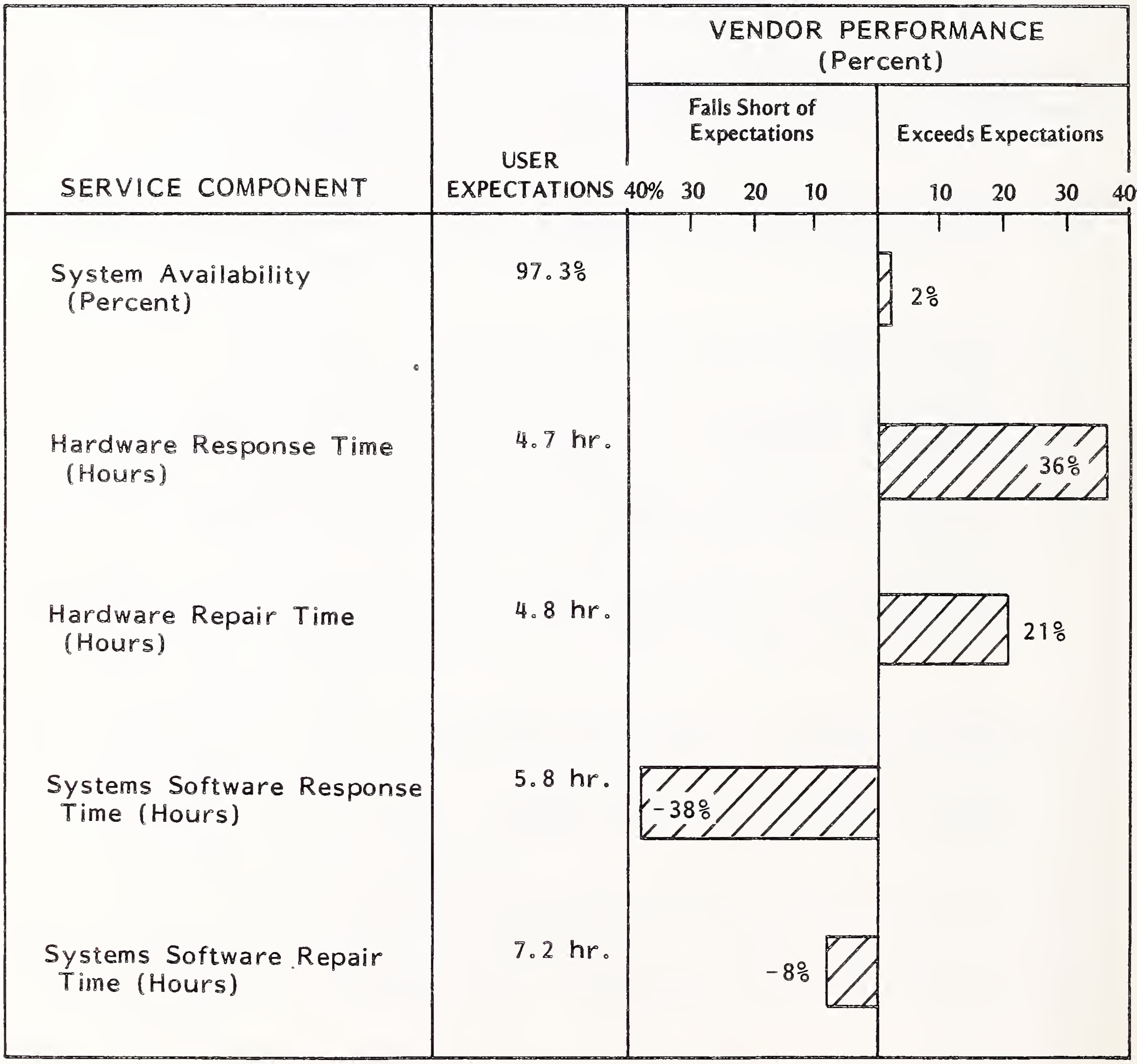
EXHIBIT III-C-9

SERVICE PERFORMANCE
IBM

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	97.2%	99.3%
Average Number of Interruptions		
Per Month (Number)	0.9	0.9
Percent Hardware Caused	65.0%	33.0%
Percent Software Caused	25.0%	24.0%
Average Hardware Response Time (Hours)	2.8 hr.	3.0 hr.
Average Hardware Repair Time (Hours)	3.3 hr.	3.8 hr.
Average Systems Software Response Time (Hours)	9.3 hr.	8.0 hr.
Average Systems Software Repair Time (Hours)	19.5 hr.	7.8 hr.

EXHIBIT III-C-10

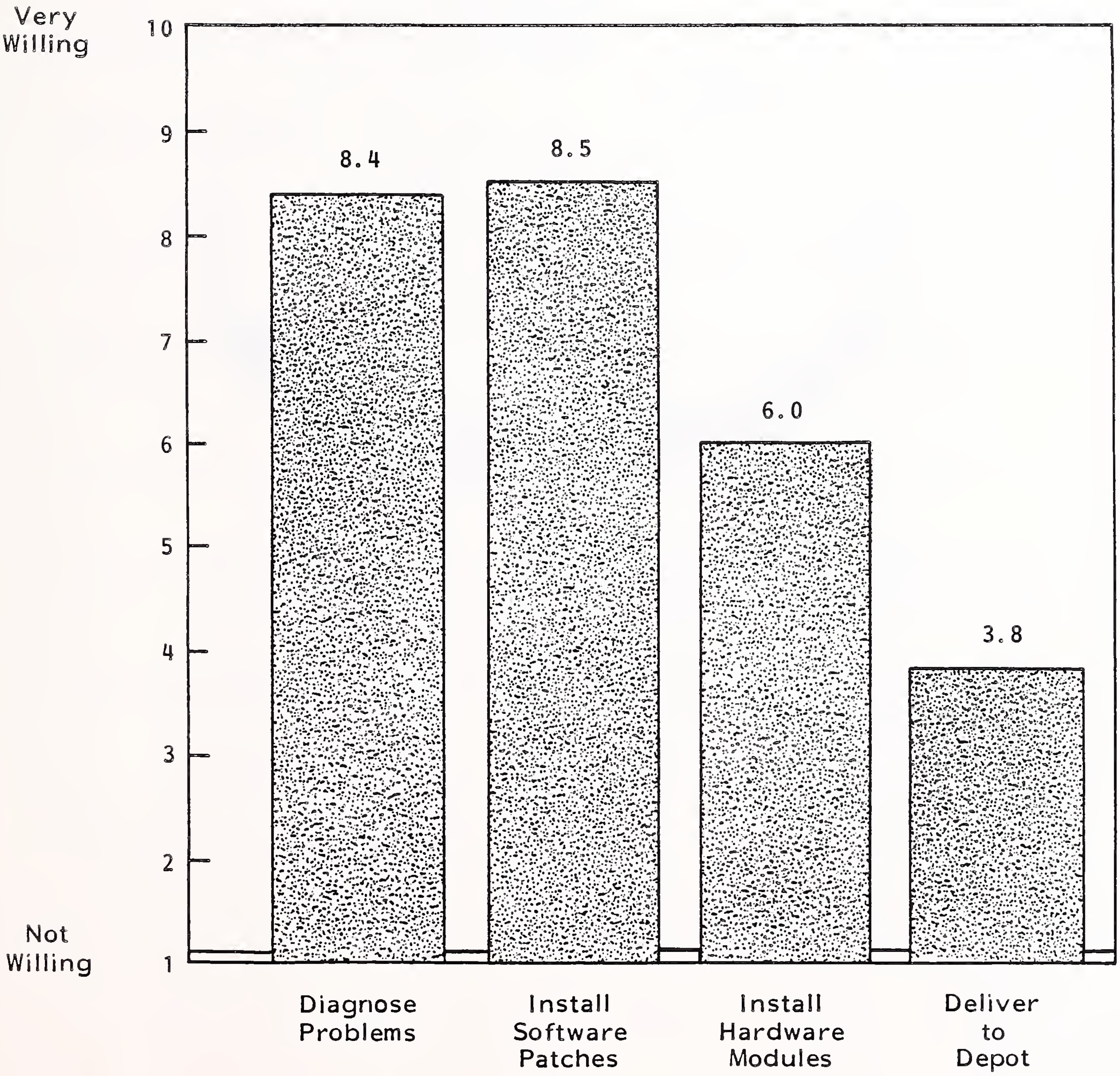
USER EXPECTATIONS FOR SERVICE PERFORMANCE
IBM



SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent)
System Availability (Percent)	97.3%	2%
Hardware Response Time (Hours)	4.7 hr.	36%
Hardware Repair Time (Hours)	4.8 hr.	21%
Systems Software Response Time (Hours)	5.8 hr.	-38%
Systems Software Repair Time (Hours)	7.2 hr.	-8%

EXHIBIT III-C-11

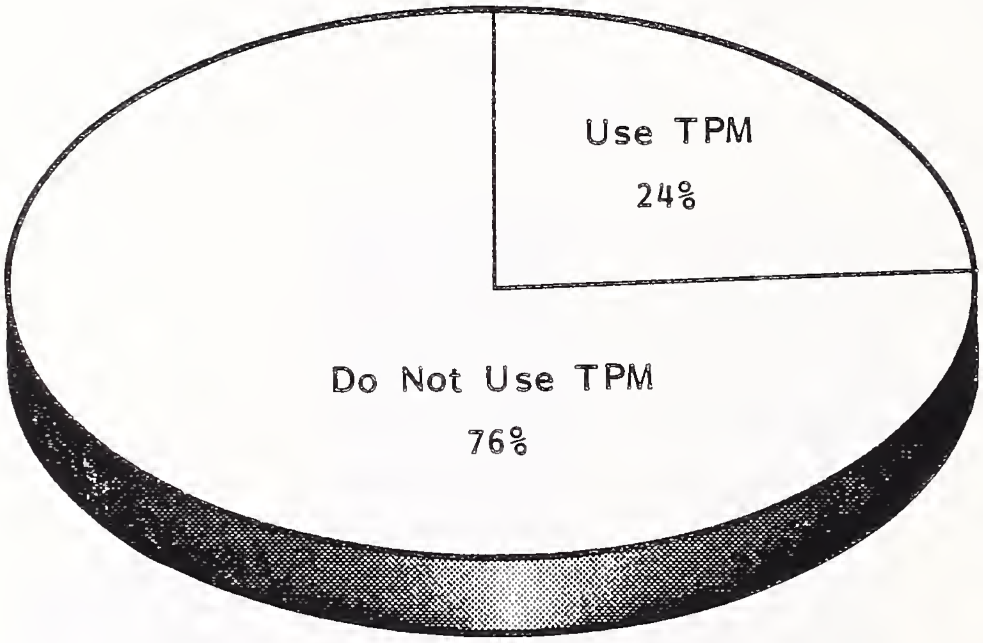
USER WILLINGNESS TO PERFORM MAINTENANCE
IBM



* Average Standard Error: 0.3

EXHIBIT III-C-12

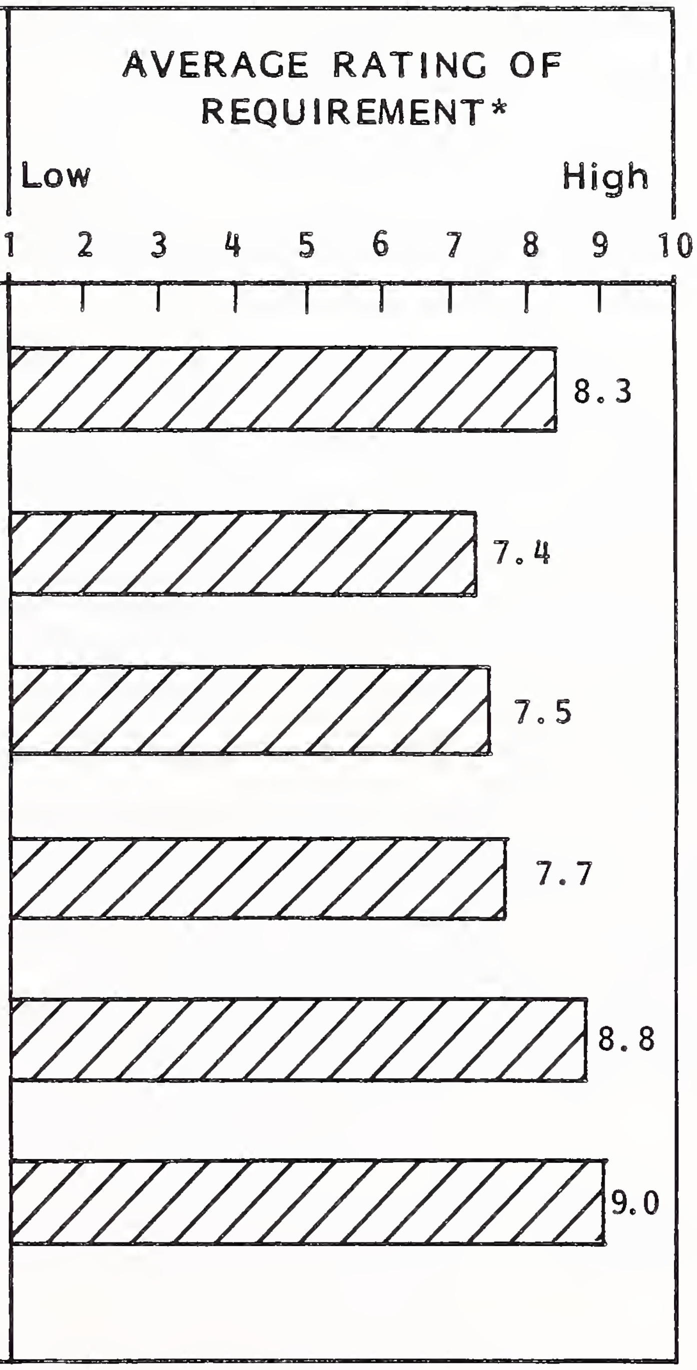
CURRENT TPM USE
IBM



Almost one-quarter of System 36 users are experienced with IBM, a number that will surely rise as the product matures.

EXHIBIT III-C-13

USER REQUIREMENTS FOR EXTENDED SERVICES
IBM



SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT* (Low 1 – 10 High)
Standby Coverage	64%	8.3
Remote Diagnostics	36	7.4
Preventive Maintenance during Non-Prime Hours	44	7.5
Deferred Response	12	7.7
Under Two-Hour Response	40	8.8
Maintenance Management	72	9.0

*Average Standard Error: 0.3

III D. DATA GENERAL

- INPUT interviewed 25 Data General Eclipse minicomputer users in the months of April and May 1986, attempting to measure Data General's ability to satisfy the hardware maintenance and systems software support requirements of their users. All interviews were conducted by telephone, each lasting approximately 20 minutes. INPUT targeted data processing and computer operations managers as respondents. The industry breakdown of the Eclipse sample was fairly diverse, with 11 of the 14 commonly accepted industry groupings represented.

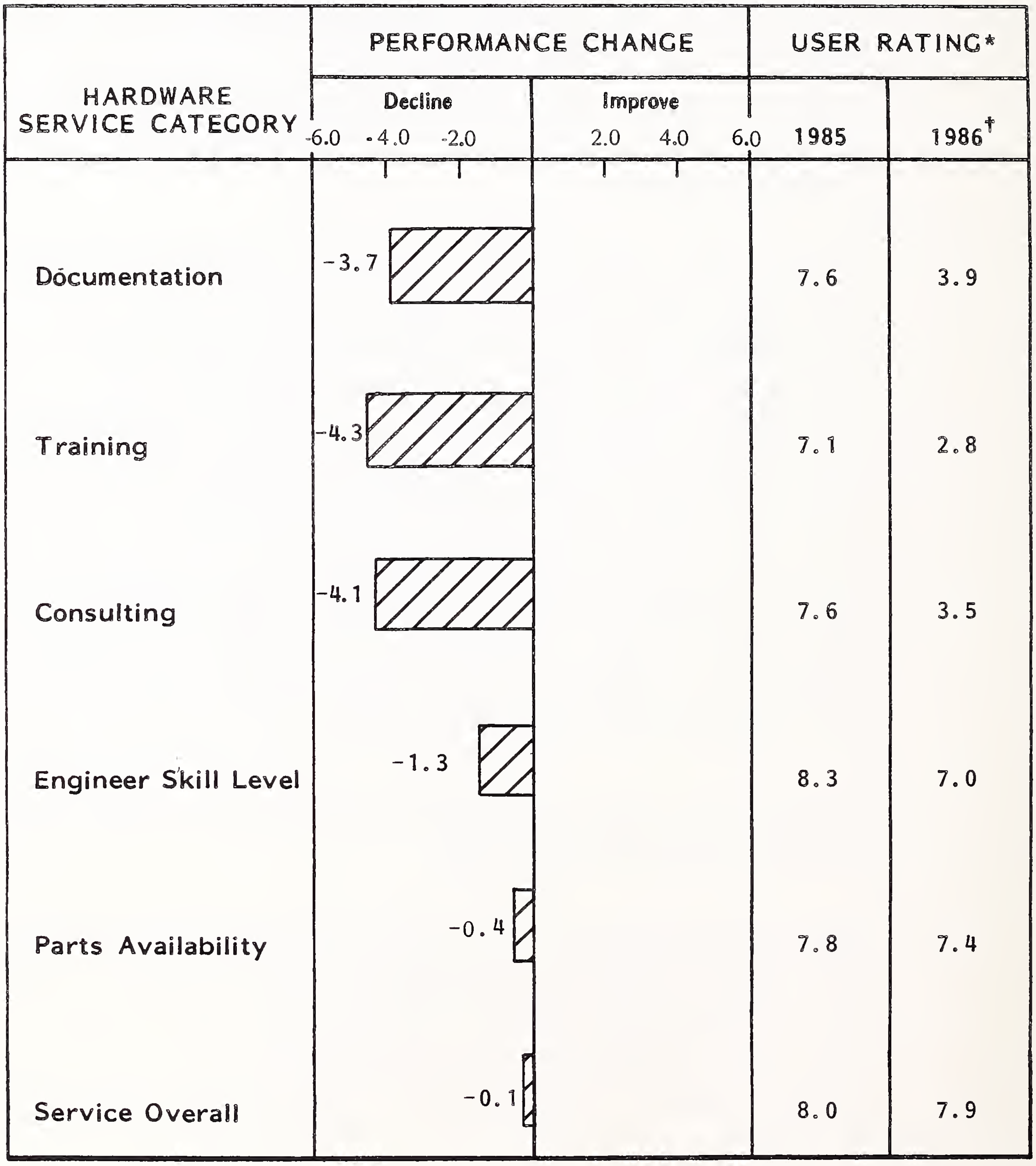
- Exhibit III-D-1 indicates that the Eclipse sample reported much lower "received" levels of service in 1986, particularly in the areas of hardware documentation, training, and consulting. Exhibit III-D-2 shows that in light of these drops, DG failed to meet their user requirement levels in two of these areas--documentation and training. However, user requirements for these three services are extremely low; hence, DG is able to satisfy a surprisingly large percentage of their users in these areas, as shown in Exhibit III-D-3. Much more important to these users are FE skill level, parts availability, and hardware service overall. In fact, this year's sample of DG Eclipse users were most satisfied with the improvements demonstrated in FE skill level. Even though DG still does not meet their users' requirement level in this area, DG still manages to satisfy 54% of their users, up from 21% in 1985.

- Exhibit III-D-4 graphically demonstrates the dramatic gap in user requirements for these hardware services.

- Exhibit III-D-5 indicates that with the exception of software engineer skill level (which is similar to the hardware engineer rating), DG minicomputer users reported lower "received" levels of service than in 1985. Curiously, these users also gave the widest range of responses in the area of systems software support, as indicated by the large average standard error of the

EXHIBIT III-D-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
DATA GENERAL



HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING* 1985	USER RATING* 1986†
Documentation	-3.7	7.6	3.9
Training	-4.3	7.1	2.8
Consulting	-4.1	7.6	3.5
Engineer Skill Level	-1.3	8.3	7.0
Parts Availability	-0.4	7.8	7.4
Service Overall	-0.1	8.0	7.9

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-D-2

1986 USER HARDWARE SERVICE RATINGS
DATA GENERAL

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	4.7	3.9	(0.8)
Training	3.7	2.8	(0.9)
Consulting	3.4	3.5	0.1
Remote Support	2.1	2.0	(0.1)
Engineer Skill Level	8.0	7.0	(1.0)
Parts Availability	9.1	7.4	(1.7)
Hardware Service Overall	8.9	7.9	(1.0)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-D-3

USER SATISFACTION: HARDWARE SERVICE
DATA GENERAL

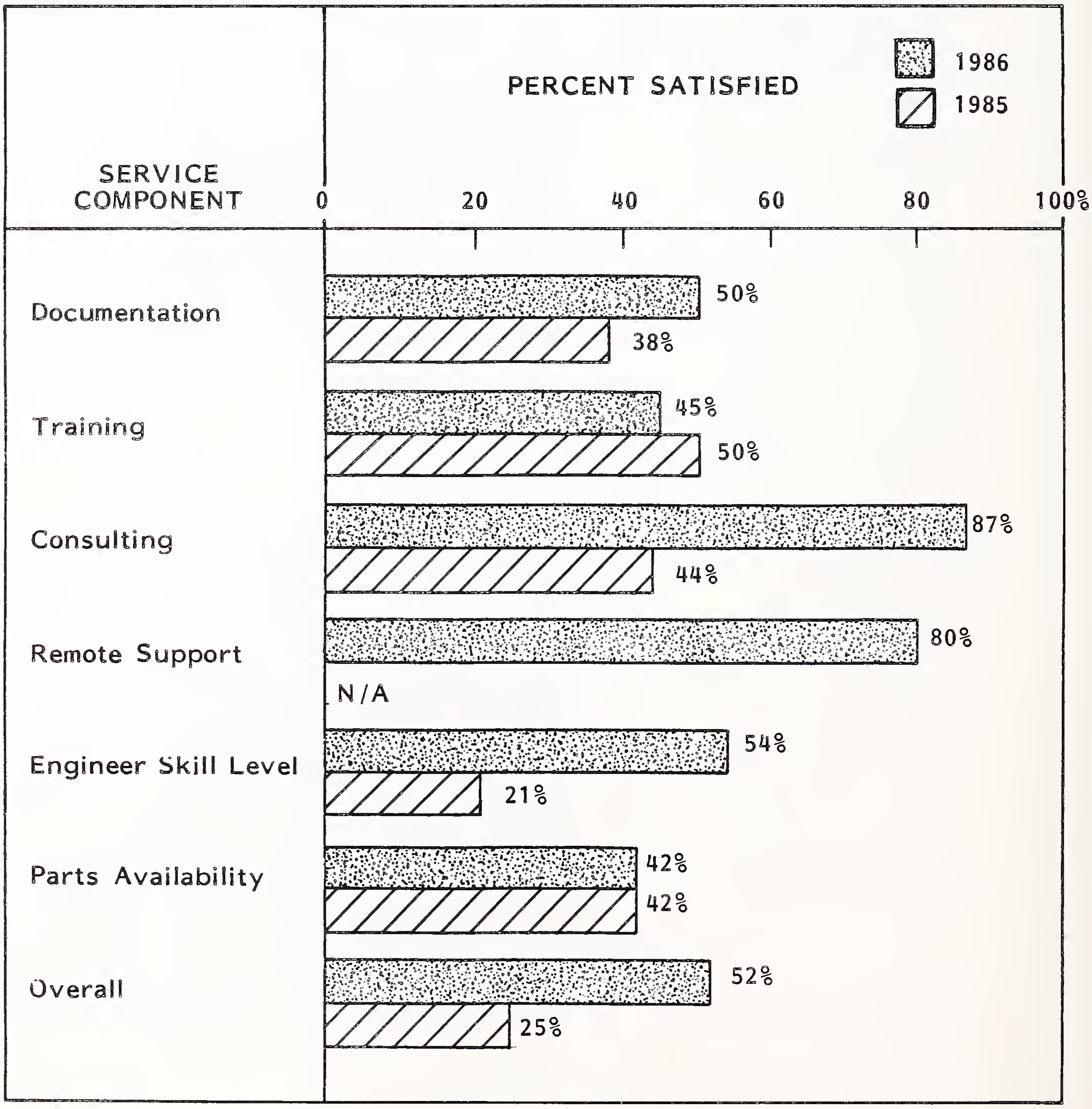
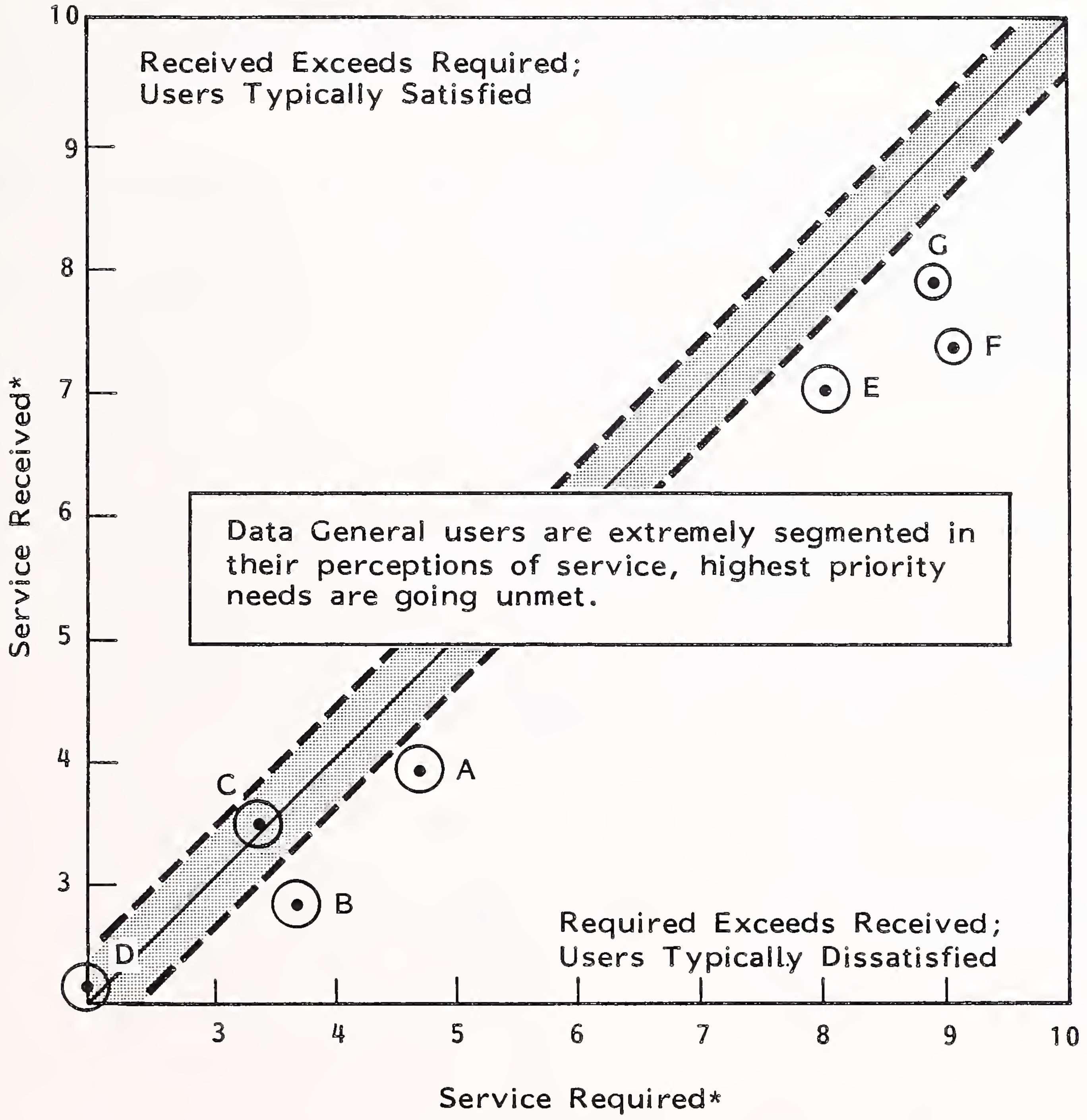


EXHIBIT III-D-4

HARDWARE SERVICES REQUIRED/RECEIVED
DATA GENERAL



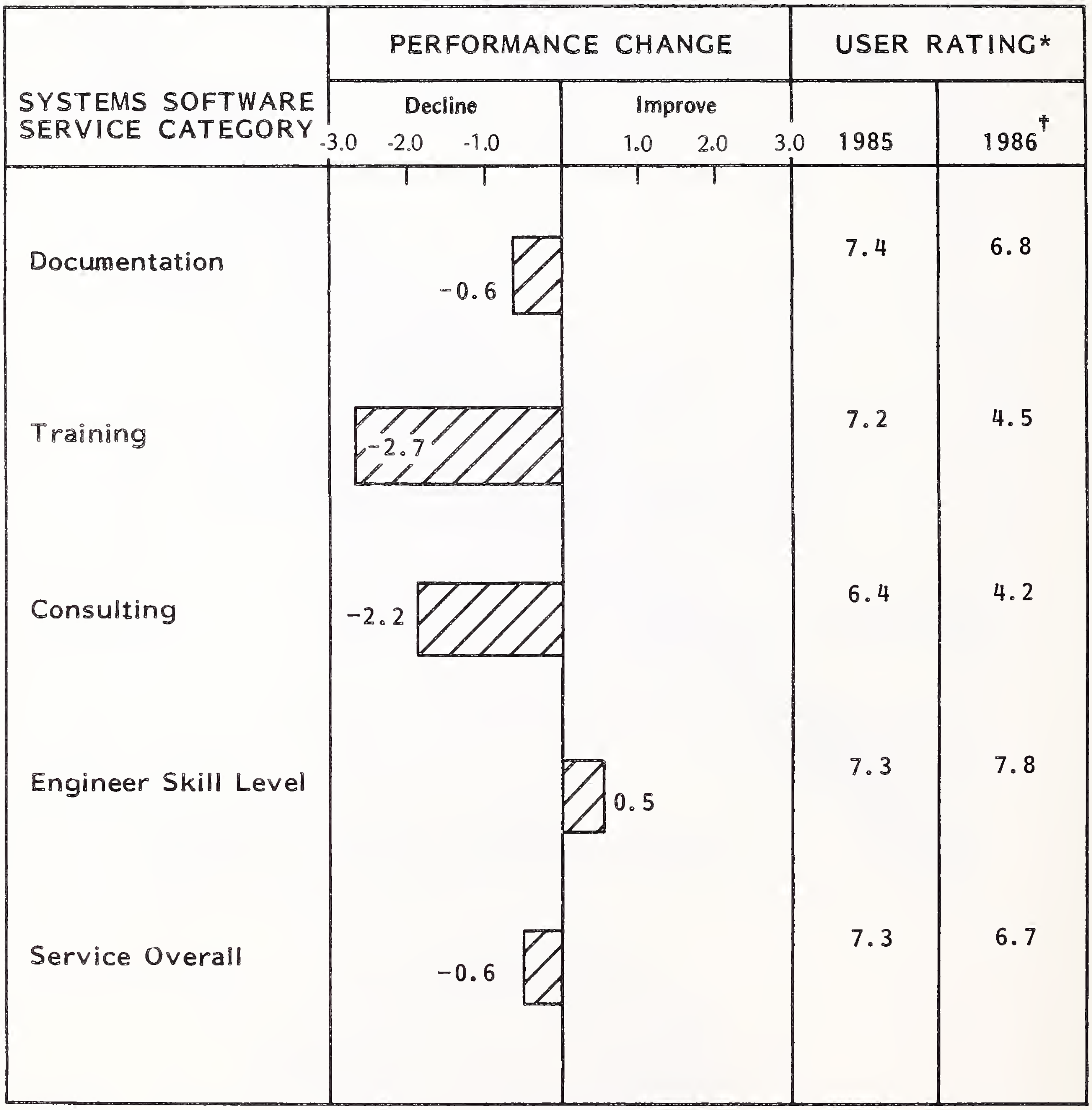
Data General users are extremely segmented in their perceptions of service, highest priority needs are going unmet.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-D-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
DATA GENERAL



SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING* 1985	USER RATING* 1986†
Documentation	-0.6	7.4	6.8
Training	-2.7	7.2	4.5
Consulting	-2.2	6.4	4.2
Engineer Skill Level	0.5	7.3	7.8
Service Overall	-0.6	7.3	6.7

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.6

mean (shown in Exhibit III-D-6), suggesting that DG support in this area is very inconsistent. This is further supported by Exhibit III-D-7, which indicates that even though the mean "received" ratings are below the users' "requirements" (shown also in Exhibit III-D-8), a large number of users are still satisfied with their software support. This suggests that there are a small number of DG Eclipse users who are extremely unhappy with their software support, affecting the mean ratings to a degree disproportionate to actual numbers.

- Exhibit III-D-9 indicates that the Eclipse's system availability slipped from just under 95% in 1985 to approximately 91% in 1986. Both hardware response and repair times were the principal causes; hardware repair time was more than double that of last year's response and 40% slower than the Eclipse users' requirement, as shown in Exhibit III-D-10. Spare parts accessibility appears to be a major part of the problem.

- In Data General's defense, the vast majority of the Eclipse respondents were users of the older "S" series (e.g., S120 and S140 Eclipse) and not the newer technology C/30 Eclipse. Still, the fact that these users are experiencing reliability and responsiveness problems will make it difficult to convince these users to upgrade to newer systems.

- Surprisingly, Data General users are not highly motivated to increase their own involvement in maintenance, as shown in Exhibit III-D-11, even when such activities would cut down on system downtime. Also surprising is the low percentage of users experienced with third-party maintenance, as shown in Exhibit III-D-12, especially considering the advancing years of some of the sample's products.

- Exhibit III-D-13 supports the hypothesis that there are a small but extremely dissatisfied group of Eclipse users (indicated in the discussion about systems software support). While there is no premium serivce that attracts a large percentage of users, two services--standby coverage and maintenance

EXHIBIT III-D-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
DATA GENERAL

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	8.2	6.8	(1.4)
Training	4.8	4.5	(0.3)
Consulting	4.2	4.2	-
Remote Support	6.0	5.2	(0.8)
Engineer Skill Level	8.2	7.8	(0.4)
Service Overall	6.8	6.7	(0.1)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.8

EXHIBIT III-D-7

USER SATISFACTION : SOFTWARE SERVICE
DATA GENERAL

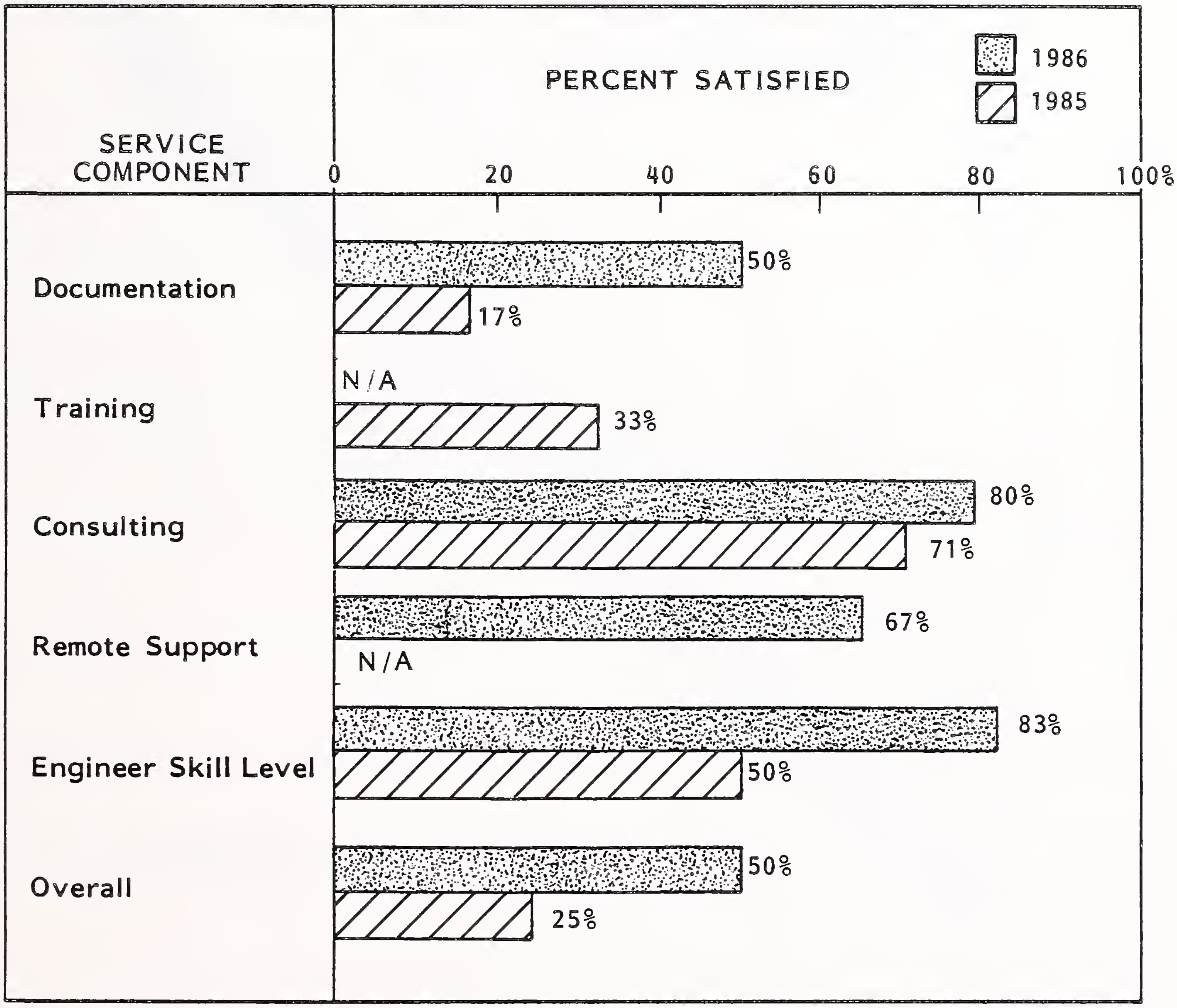
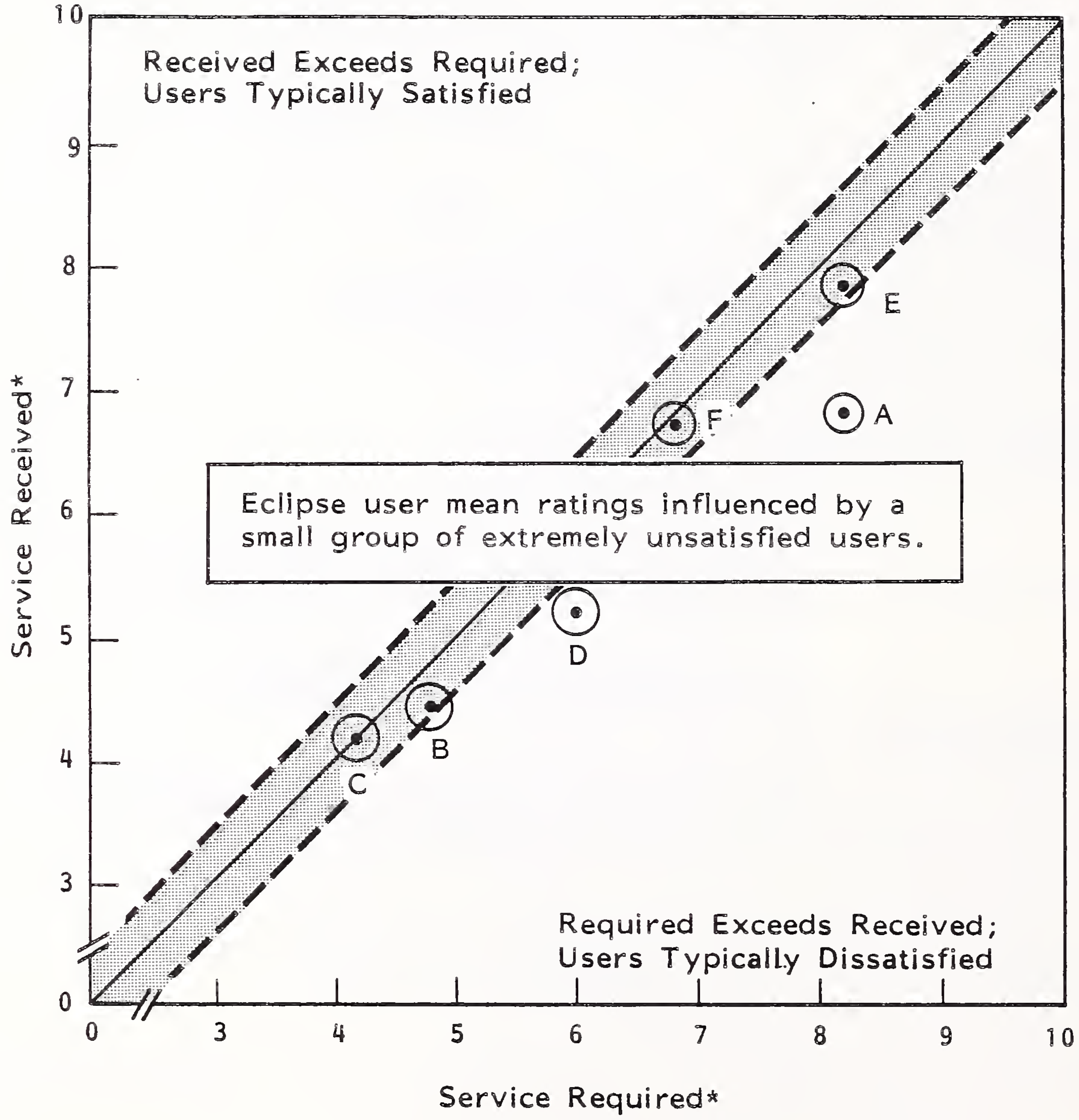


EXHIBIT III-D-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
DATA GENERAL



Eclipse user mean ratings influenced by a small group of extremely unsatisfied users.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-D-9

SERVICE PERFORMANCE
DATA GENERAL

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	94.8%	90.8%
Average Number of Interruptions		
Per Month (Number)	2.7	2.1
Percent Hardware Caused	66.0%	56.0%
Percent Software Caused	33.0%	37.0%
Average Hardware Response Time (Hours)	3.6 hr.	4.8 hr.
Average Hardware Repair Time (Hours)	3.5 hr.	8.1 hr.
Average Systems Software Response Time (Hours)	3.1 hr.	3.9 hr.
Average Systems Software Repair Time (Hours)	16.0 hr.	2.8 hr.

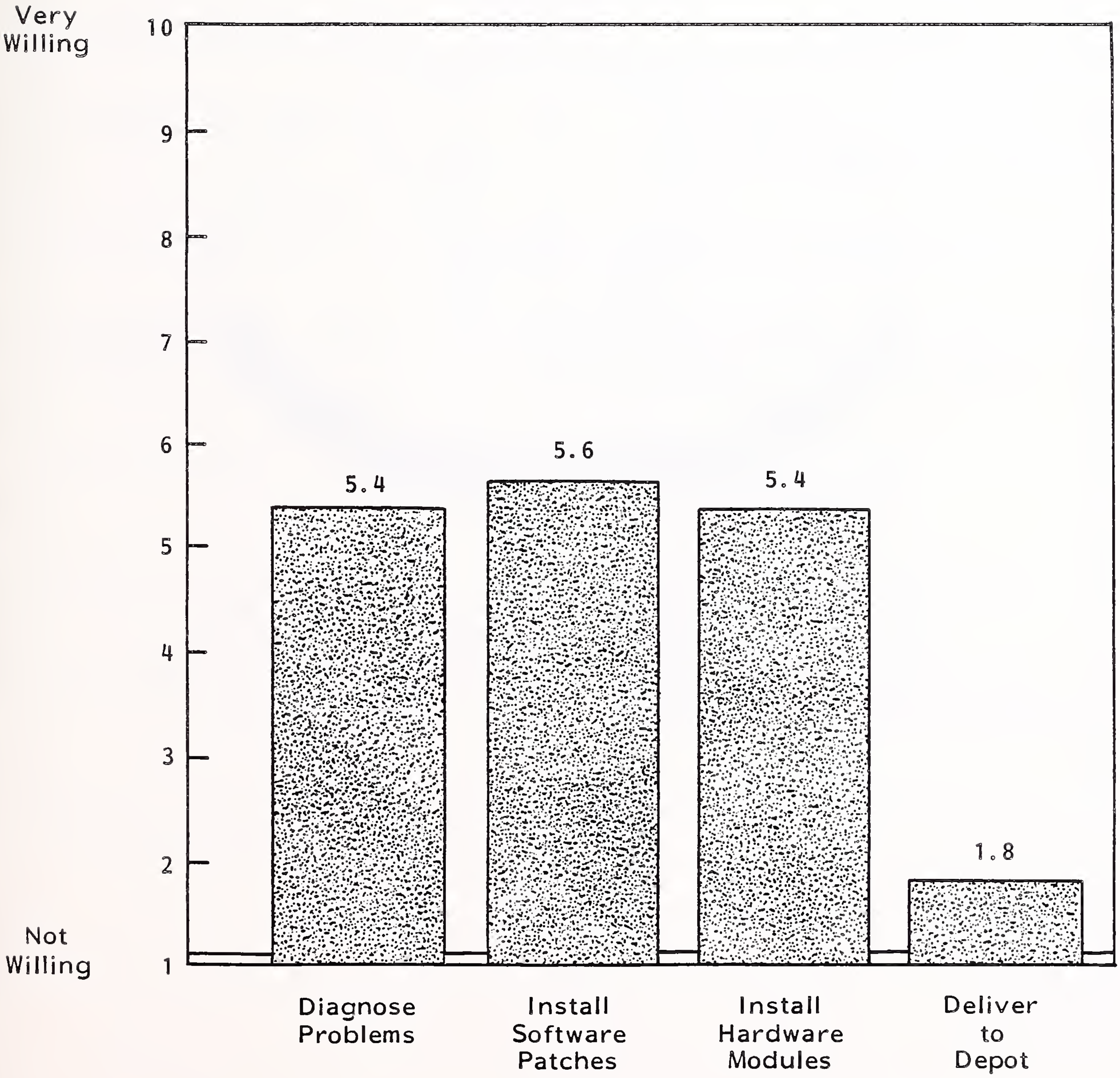
EXHIBIT III-D-10

USER EXPECTATIONS FOR SERVICE PERFORMANCE
DATA GENERAL

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent) Falls Short of Expectations (40% 30 20 10)	VENDOR PERFORMANCE (Percent) Exceeds Expectations (10 20 30 40%)
System Availability (Percent)	93.6%	3%	
Hardware Response Time (Hours)	4.0 hr.	-20%	
Hardware Repair Time (Hours)	5.3 hr.	-40%	
Systems Software Response Time (Hours)	4.7 hr.		17%
Systems Software Repair Time (Hours)	3.7 hr.		24%

EXHIBIT III-D-11

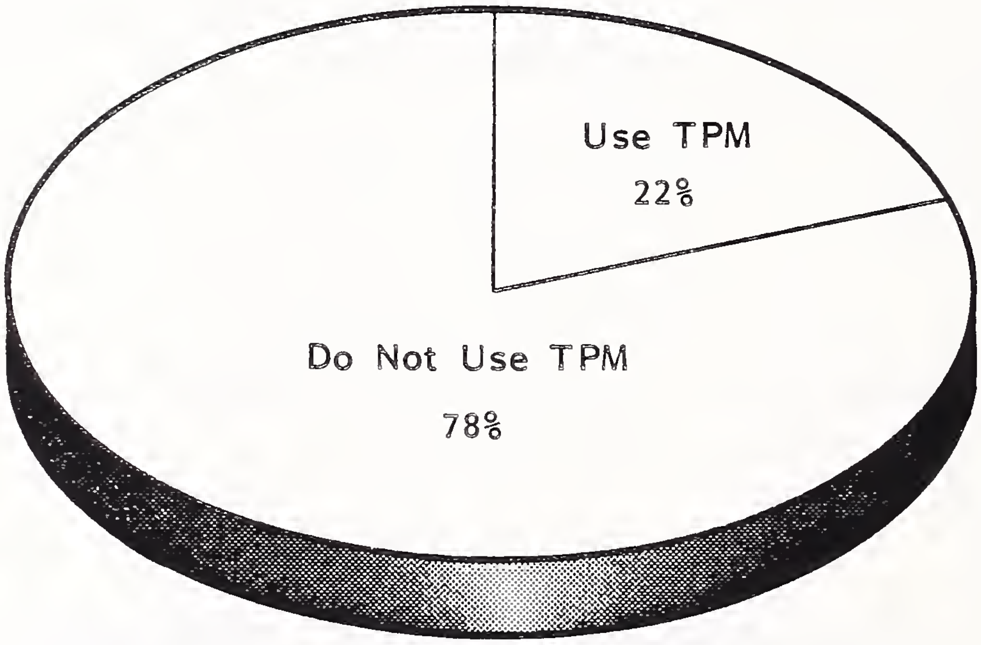
USER WILLINGNESS TO PERFORM MAINTENANCE
DATA GENERAL



* Average Standard Error: 0.4

EXHIBIT III-D-12

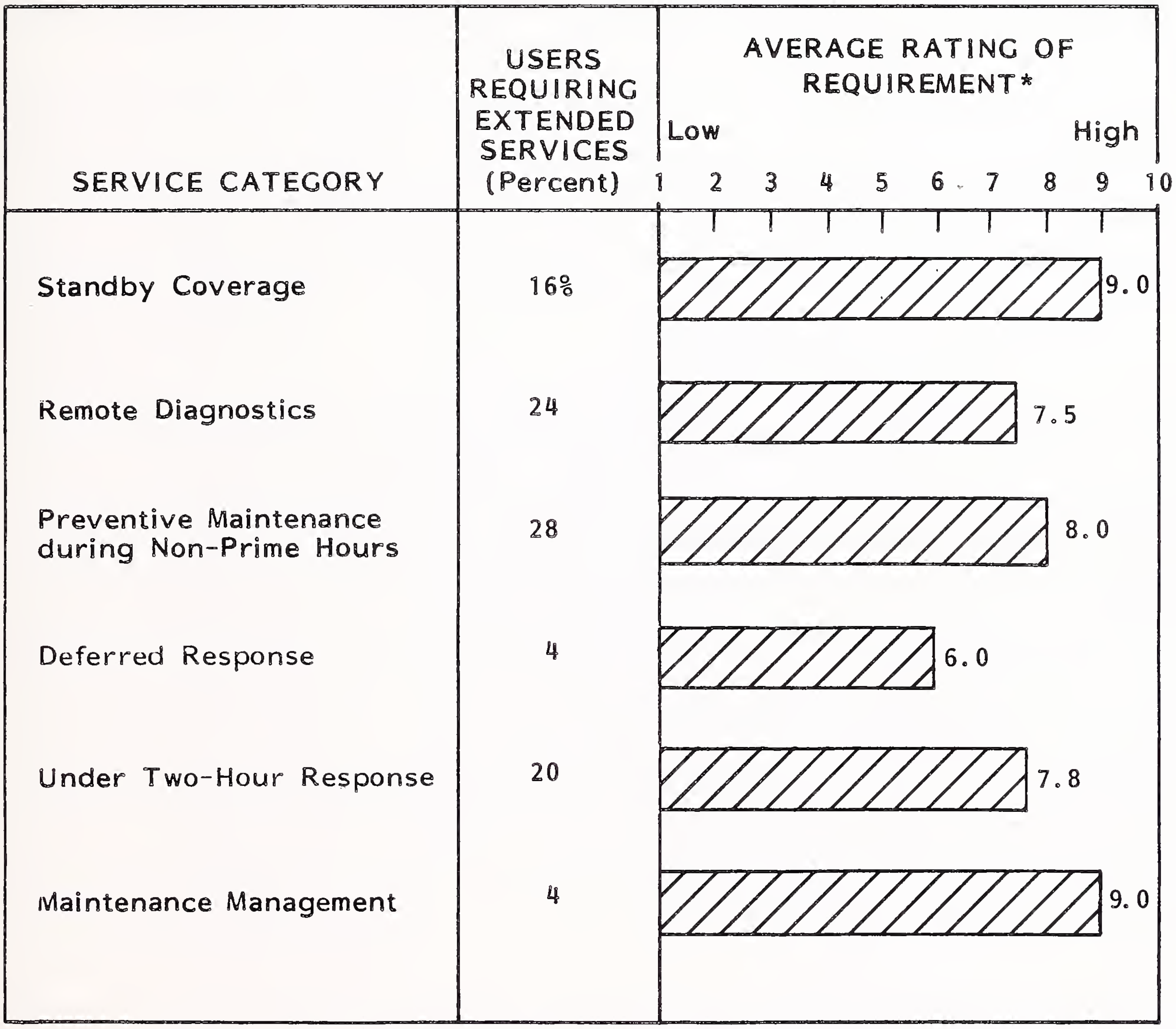
CURRENT TPM USE
DATA GENERAL



Eclipse user experience with TPM is rather limited considering the age of the product.

EXHIBIT III-D-13

USER REQUIREMENTS FOR EXTENDED SERVICES
DATA GENERAL



SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT*
Standby Coverage	16%	9.0
Remote Diagnostics	24	7.5
Preventive Maintenance during Non-Prime Hours	28	8.0
Deferred Response	4	6.0
Under Two-Hour Response	20	7.8
Maintenance Management	4	9.0

*Average Standard Error: 0.3

management contracts--receive very strong ratings of 9.0. However, providing these contract options would require expending a large amount of resources to satisfy a small segment of users, and therefore cannot be recommended.

III E. CONCURRENT COMPUTER CORPORATION

- In April 1986 INPUT interviewed 25 Concurrent 32XX superminicomputer users regarding their current satisfaction with the level of service received versus their required levels of service. All interviews were performed over the telephone, each lasting approximately 20 minutes. As always, INPUT has targeted data processing and operations managers as responsents; however, the very nature of Concurrent's market required that we interview engineering managers as well. Not surprisingly, our sample had a concentration of process manufacturers (with 24% of the sample), discrete manufacturers (20%), and services (also 20%) which presumably target manufacturing companies.

- Exhibit III-E-1 illustrates that Concurrent has made marked improvements in the areas of professional and educational services, both considered key areas of the engineering and scientific marketplace in which Concurrent participates. However, Concurrent users indicate concern over FE skill level, with a perceived drop in performance within the acceptable limits of the standard error of the mean. This concern is highlighted again in Exhibit III-E-2, which demonstrates that FE skill level falls well below user requirements. In addition, users are still concerned with spare parts availability, even though improvement was recognized in this area. Still, the high system availability requirements of these users place unusually high requirements on vendors to assure that the downtime caused or increased as a result of unavailable spare parts is minimized. As a result of these two factors, overall user satisfaction for service suffers.

- Exhibit III-E-3 demonstrates increased Concurrent user satisfaction with such post-sales services as training and consulting. The exhibit shows that user satisfaction with FE skill level has risen dramatically between 1985 and 1986, suggesting that, in light of the drop in actual performance in Exhibit III-E-1, user requirement for FE skill level in 1985 was relatively low. Again, the

EXHIBIT III-E-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
CONCURRENT

HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE Decline -1.5 -1.0 -0.5	PERFORMANCE CHANGE Improve 0.5 1.0 1.5	USER RATING* 1985	USER RATING* 1986†
Documentation	-0.1		7.4	7.3
Training		0.9	6.4	7.3
Consulting		1.0	6.3	7.3
Engineer Skill Level	-0.6		8.6	8.0
Parts Availability		0.1	7.5	7.6
Service Overall	-0.4		8.6	8.2

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-E-2

1986 USER HARDWARE SERVICE RATINGS
CONCURRENT

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	7.6	7.3	(0.3)
Training	6.6	7.7	1.1
Consulting	6.9	7.3	0.4
Remote Support	4.7	6.8	2.1
Engineer Skill Level	8.9	8.0	(0.9)
Parts Availability	9.1	7.6	(1.5)
Hardware Service Overall	9.2	8.2	(1.0)

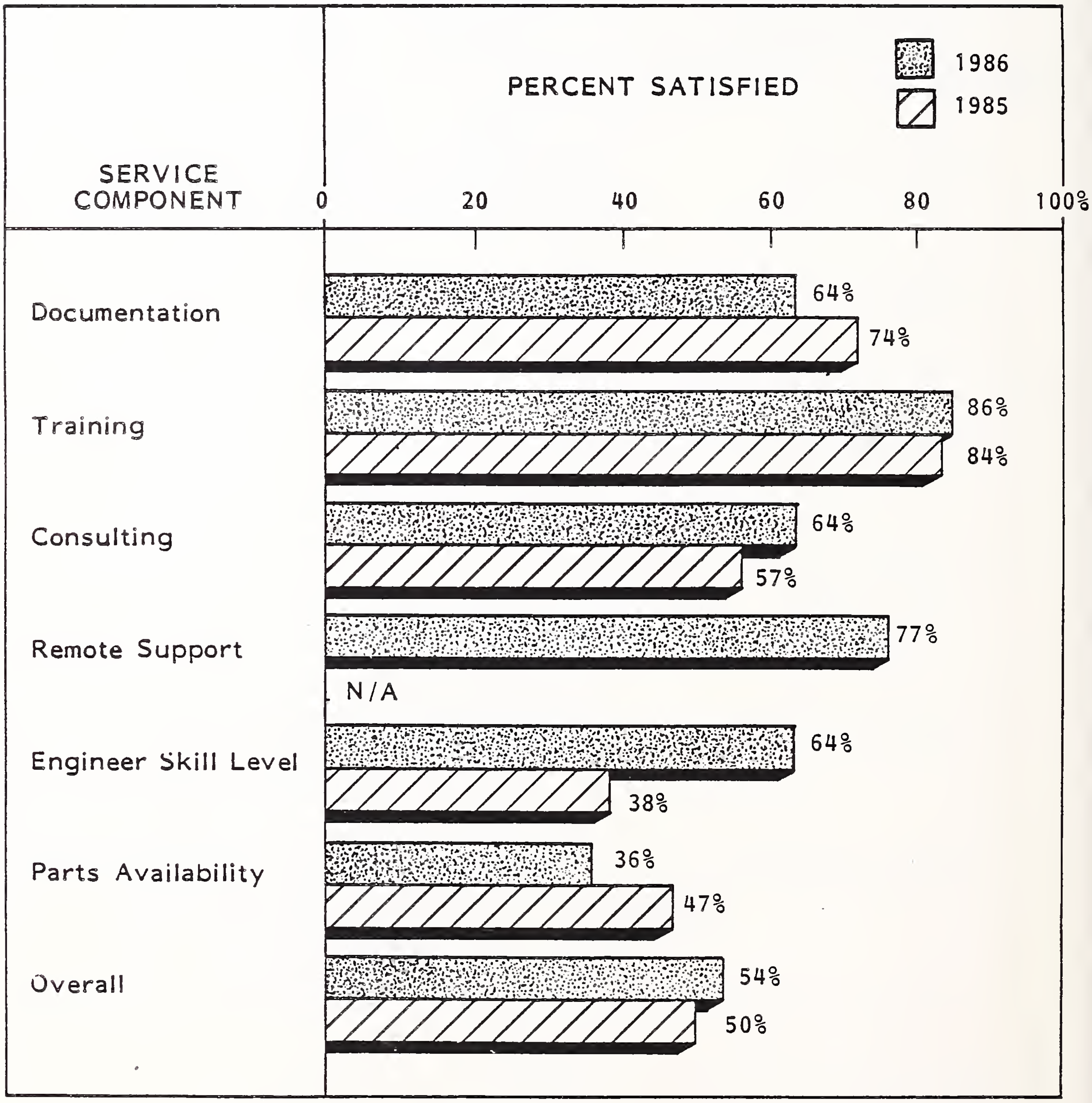
▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-E-3

USER SATISFACTION: HARDWARE SERVICE CONCURRENT



greatest concern should be placed on spares, since the exhibit demonstrates a significant decline in the percentage of Concurrent users who are satisfied (47% in 1985 and only 36% in 1986). Exhibit III-E-4 graphically plots the relationship between user requirements for a particular service and the level that they receive. Note that parts availability, FE skill level, and overall satisfaction with hardware service are both highest in importance and farthest from the line representing the target area. Concurrent needs to focus their attention on reducing the service gap in these key service areas.

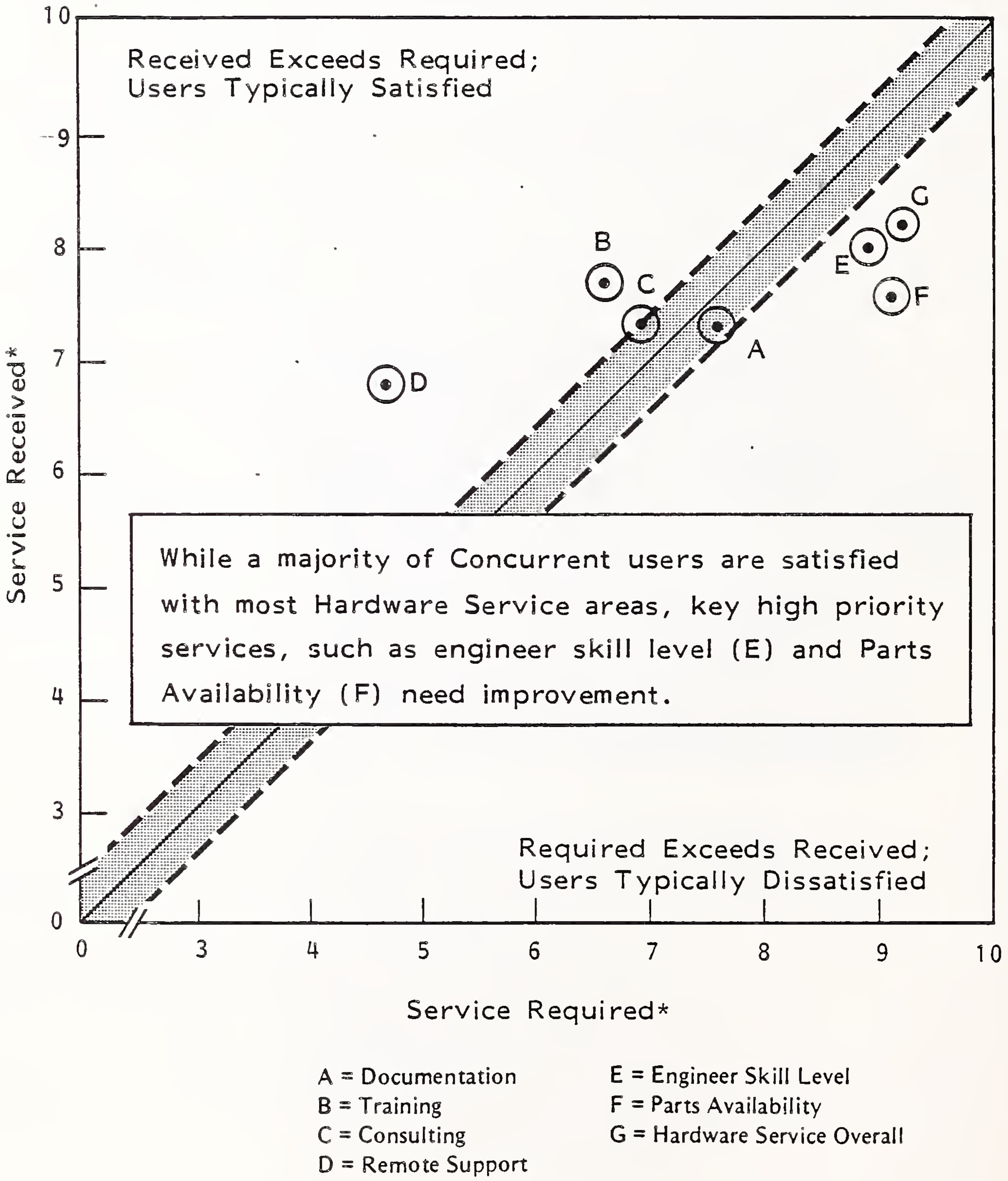
- Concurrent has been much more successful in addressing the rapidly growing service and support requirements of their users in the area of system software support. Although Exhibit III-E-5 shows that users perceived relatively little improvement in the majority of systems software support areas, user satisfaction in virtually all areas comes close to or exceeds user requirements. The exception of note is documentation, which in Exhibit III-E-6 falls below the user requirements. However, Exhibit III-E-7 indicates that even documentation as a service improved in 1986. Concurrent's ability to target and satisfy user requirements in software support should prove critical to the success of the company, due to the growing dependence on increased system availability.

- Exhibit III-E-8 provides a model for properly identifying, measuring, and satisfying the changing requirements of a user base. Note that in each area, Concurrent has provided service to their users at or above the levels required, without exceeding each requirement to such a degree that would suggest a lack of overall focus.

- Exhibit III-E-9 provides the actual numbers associated with measuring service performance. Note that in most areas, actual service performance by Concurrent has improved. System availability has improved both as a result of greater reliability of the 32XX as well as faster total turnaround on hardware and software problem resolution. Exhibit III-E-10 demonstrates that, with the sole exception of software repair time, vendor performance meets or exceeds user requirements.

EXHIBIT III-E-4

HARDWARE SERVICES REQUIRED/RECEIVED
CONCURRENT



While a majority of Concurrent users are satisfied with most Hardware Service areas, key high priority services, such as engineer skill level (E) and Parts Availability (F) need improvement.

* Rating: 1 = Low, 10 = High

EXHIBIT III-E-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
CONCURRENT

SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE		USER RATING*	
	Decline -1.5 -1.0 -0.5	Improve 0.5 1.0 1.5	1985	1986†
Documentation	-0.2		7.1	6.9
Training	-0.8		7.3	6.5
Consulting	0	0	6.4	6.4
Engineer Skill Level		0.2	7.4	7.6
Service Overall		0.1	7.4	7.5

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-E-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
CONCURRENT

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	▨ 7.3	▨ 6.9	▨ (0.4)
Training	6.2	6.5	0.3
Consulting	6.4	6.4	0.0
Remote Support	4.3	5.7	1.4
Engineer Skill Level	7.2	7.6	0.4
Service Overall	7.0	7.5	0.5

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-E-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICE
CONCURRENT

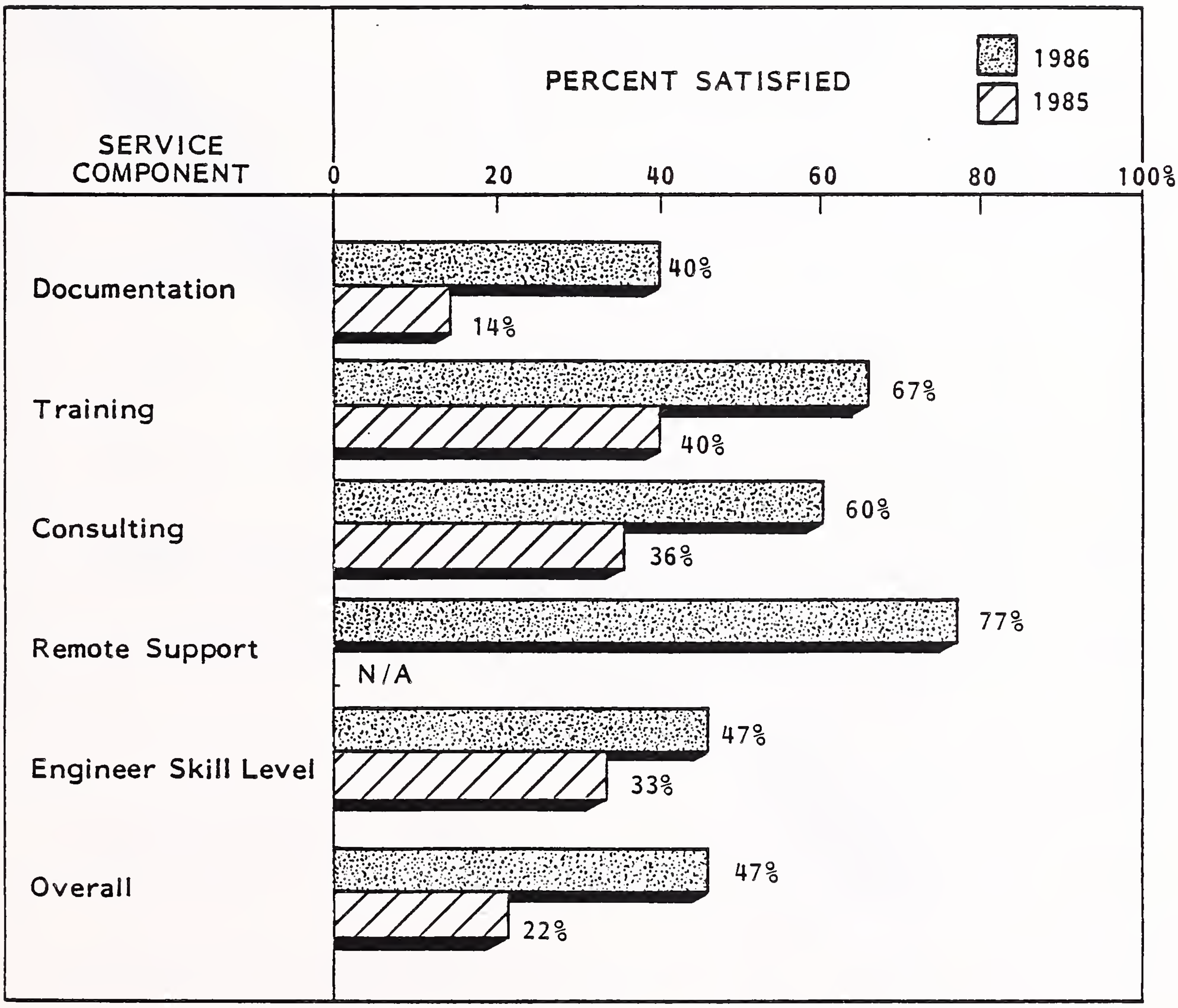
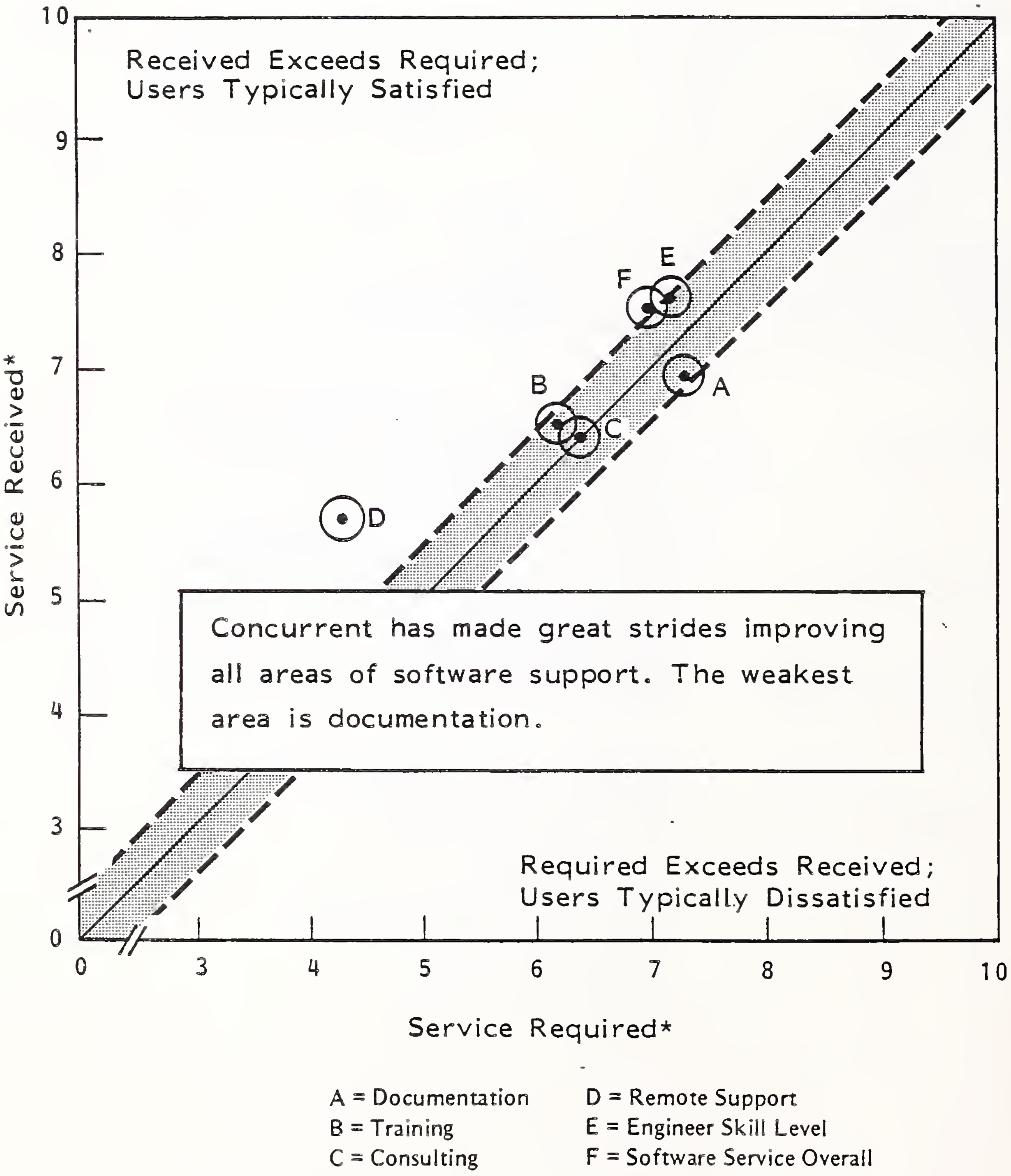


EXHIBIT III-E-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED CONCURRENT



Concurrent has made great strides improving all areas of software support. The weakest area is documentation.

* Rating: 1 = Low, 10 = High

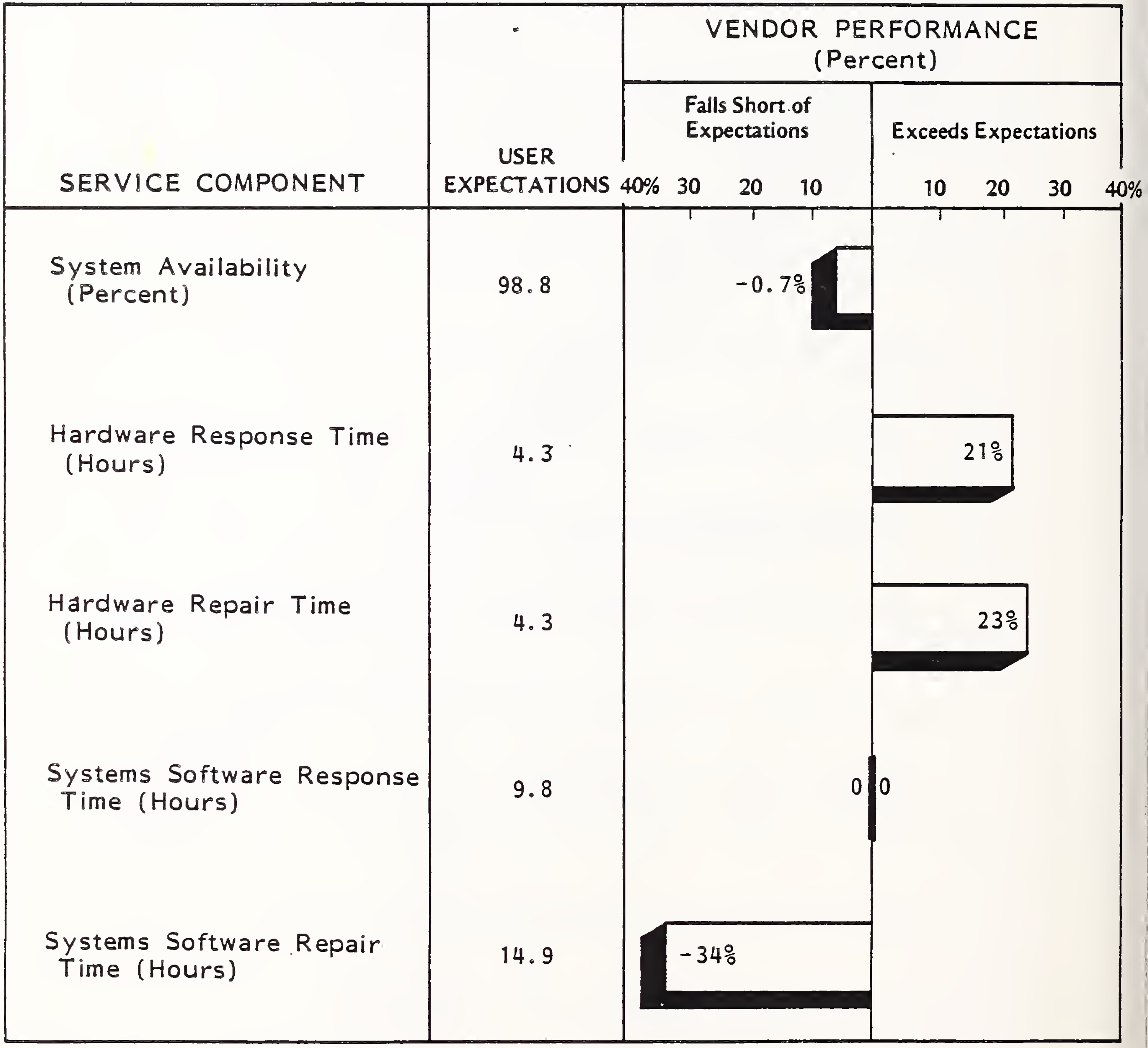
EXHIBIT III-E-9

SERVICE PERFORMANCE
CONCURRENT

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	96.3%	98.1%
Average Number of Interruptions		
Per Month (Number)	4.7	1.0
Percent Hardware Caused	71.0%	54.0%
Percent Software Caused	29.0%	21.0%
Average Hardware Response Time (Hours)	5.6 hr.	3.4 hr.
Average Hardware Repair Time (Hours)	2.6 hr.	3.3 hr.
Average Systems Software Response Time (Hours)	5.6 hr.	9.8 hr.
Average Systems Software Repair Time (Hours)	30.5 hr.	20.0 hr.

EXHIBIT III-E-10

USER EXPECTATIONS FOR SERVICE PERFORMANCE
CONCURRENT



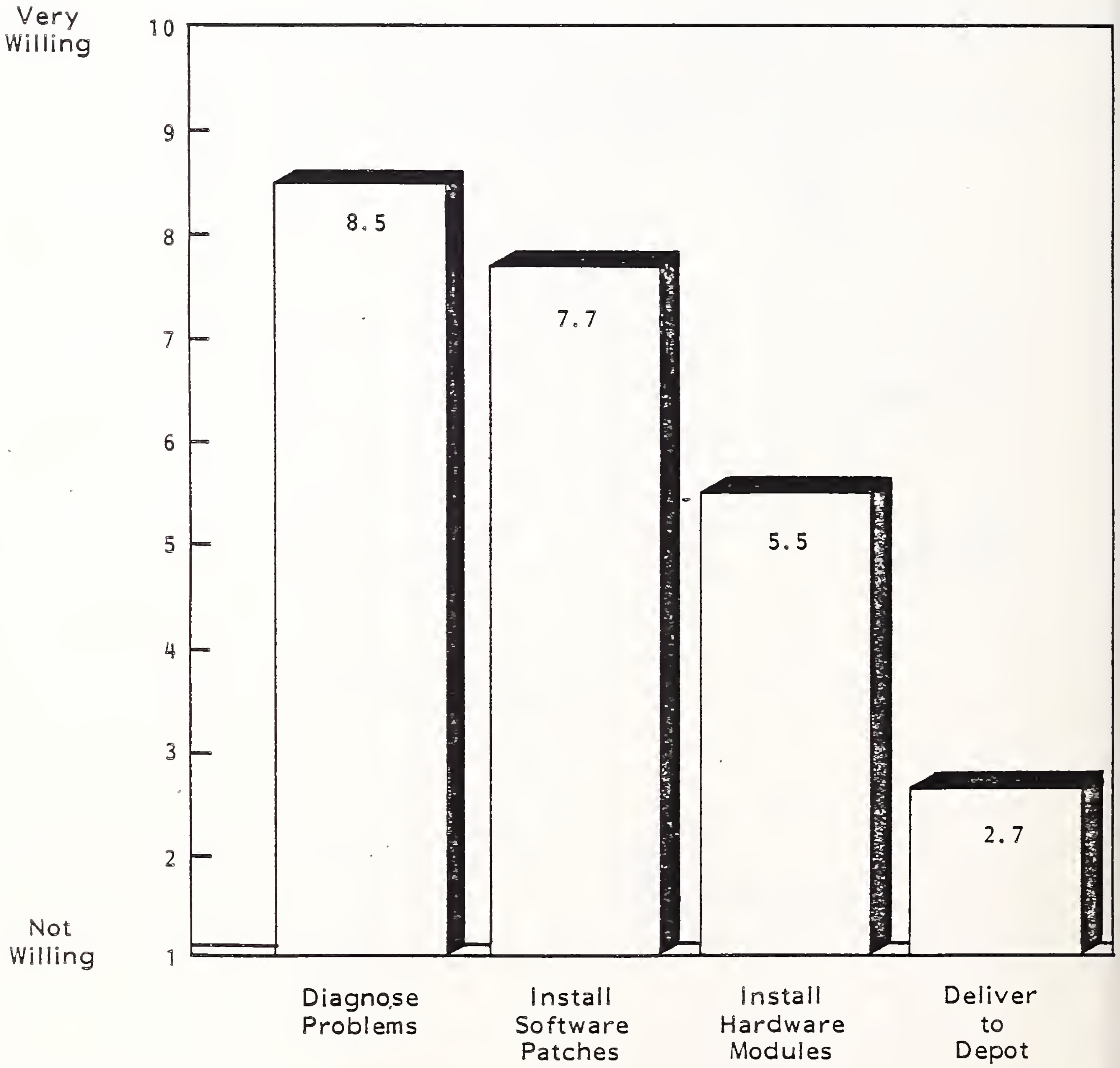
SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent)
System Availability (Percent)	98.8	-0.7%
Hardware Response Time (Hours)	4.3	21%
Hardware Repair Time (Hours)	4.3	23%
Systems Software Response Time (Hours)	9.8	0
Systems Software Repair Time (Hours)	14.9	-34%

- Not surprisingly, Concurrent user satisfaction with service has helped lock these users into Concurrent support. Exhibit III-E-11 suggests that Concurrent users prefer to leave the majority of service activities to Concurrent, and Exhibit III-E-12 shows that the majority of Concurrent users opt for manufacturer service versus third-party maintenance. One should note that INPUT has predicted that superminicomputer maintenance will become a key growth market for TPM, and this exhibit demonstrates that TPM penetration into Concurrent's use base is growing.

- This satisfaction with service has tended to limit user requirement for premium services, as shown in Exhibit III-E-13. While a large number of users reported a requirement for standby coverage, the majority of those users did not report a very high requirement for that service.

EXHIBIT III-E-11

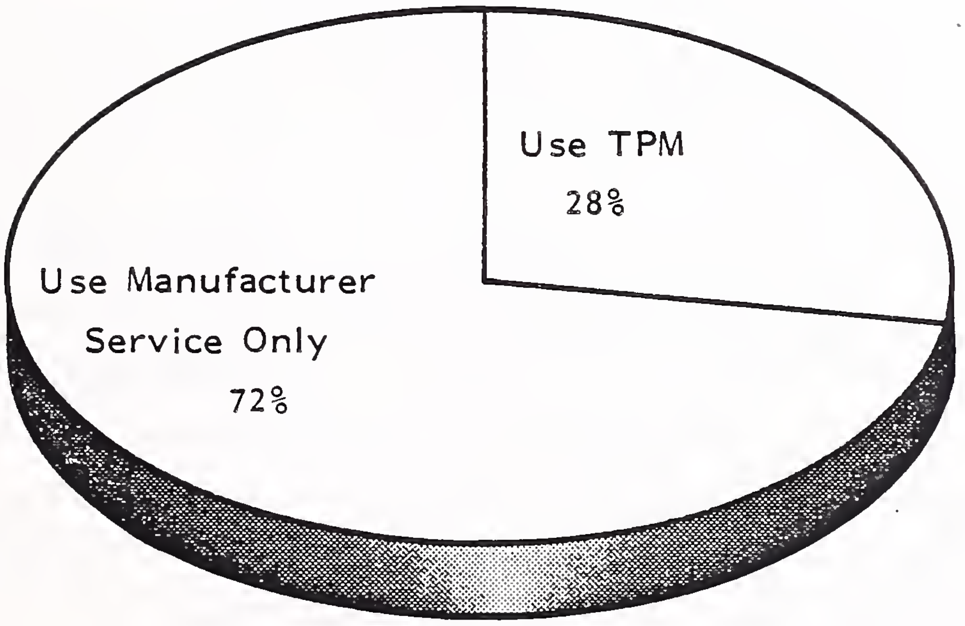
USER WILLINGNESS TO PERFORM MAINTENANCE CONCURRENT



* Average Standard Error: 0.2

EXHIBIT III-E-12

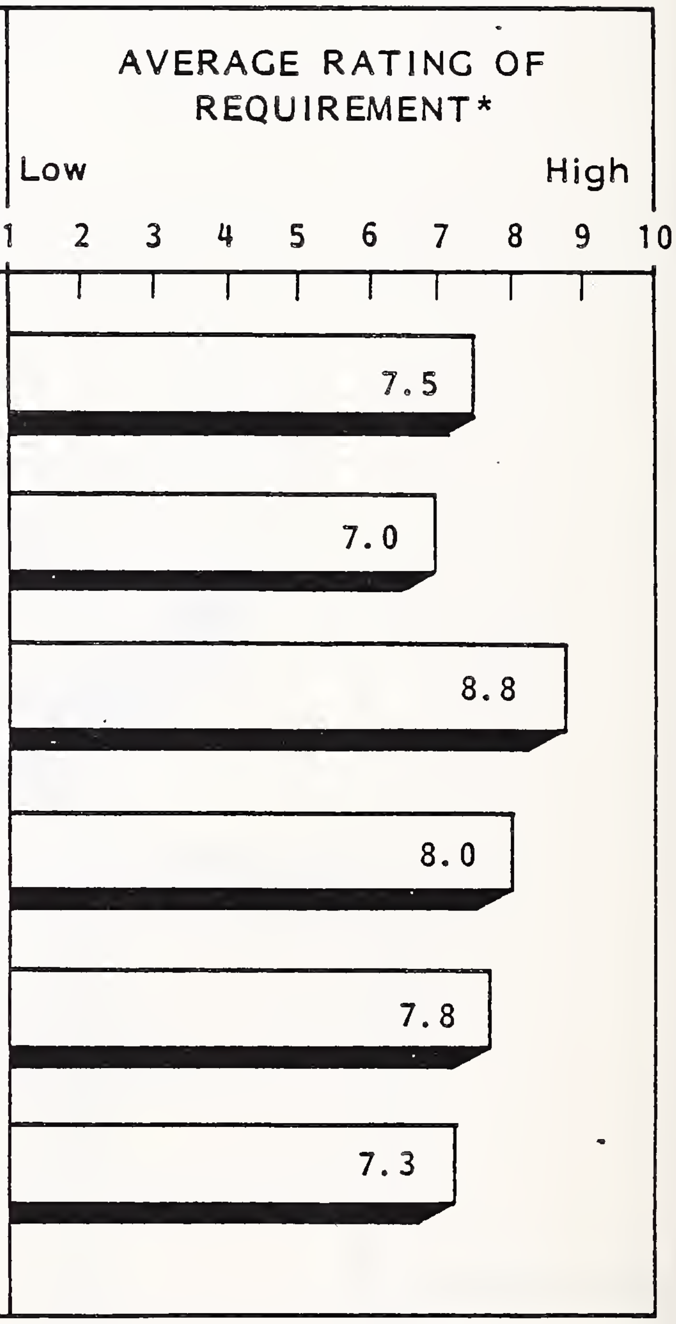
CURRENT TPM USE
CONCURRENT



TPM penetration into Concurrent user sites is limited; however, TPM growth in these sites has increased from 11% in 1985 to 28% in 1986.

EXHIBIT III-E-13

USER REQUIREMENTS FOR EXTENDED SERVICES CONCURRENT



SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT* Low–High (1–10)
Standby Coverage	44%	7.5
Remote Diagnostics	32	7.0
Preventive Maintenance during Non-Prime Hours	32	8.8
Deferred Response	18	8.0
Under Two-Hour Response	16	7.8
Maintenance Management	24	7.3

*Average Standard Error: 0.6

III F. GOULD

- In April 1986 INPUT interviewed 20 Gould 32XX superminicomputer users concerning their current satisfaction with the level of service and support that they received versus their requirements. All interviews were conducted by telephone, each lasting approximately 20 minutes. INPUT specifically targeted data processing and operations managers for this survey, although a number of the respondents were lead engineers involved in CAD/CAM applications. As with the Concurrent sample, the majority of Gould's users were involved in manufacturing, either in process manufacturing (with 30% of the sample, discrete manufacturing (25%), or services (25%). The remaining four were split between education and the federal government.

- This was the first year that Gould superminicomputer users' service requirements were analyzed, making it impossible to present time-series analyses of their service performance. Exhibit III-F-1 demonstrates that Gould service performance is very similar to that reported by their close competitor--Concurrent Computer Corporation. Users report that they receive higher than required levels of service in the areas of remote support, consulting, and training, and lower than required support in the areas of documentation, FE skill level, spare parts availability, and overall satisfaction with hardware service. Again, the most critical area of concern is of spare parts availability, which satisfies only one-fourth of Gould users, as shown in Exhibit III-F-2. While users of market leader DEC also report unmet service requirements in this key service area, DEC at least comes close to satisfying a majority (48%) of their users' needs. Gould and Concurrent will need to address the spares issue in order to gain ground on DEC.

- Exhibit III-F-3 graphically presents the success that Gould has had in satisfying user requirements in certain areas, such as training and consulting, while missing the mark in such key service areas as FE skill level and (most noticeably) spare parts availability.

EXHIBIT III-F-1

1986 USER HARDWARE SERVICE RATINGS
GOULD

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	7.1	6.9	(0.2)
Training	4.6	6.0	1.4
Consulting	5.4	5.9	0.5
Remote Support	4.0	7.3	3.3
Engineer Skill Level	8.5	7.7	(0.8)
Parts Availability	9.0	7.2	(1.8)
Hardware Service Overall	8.5	7.5	(1.0)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-F-2

USER SATISFACTION: HARDWARE SERVICE
GOULD

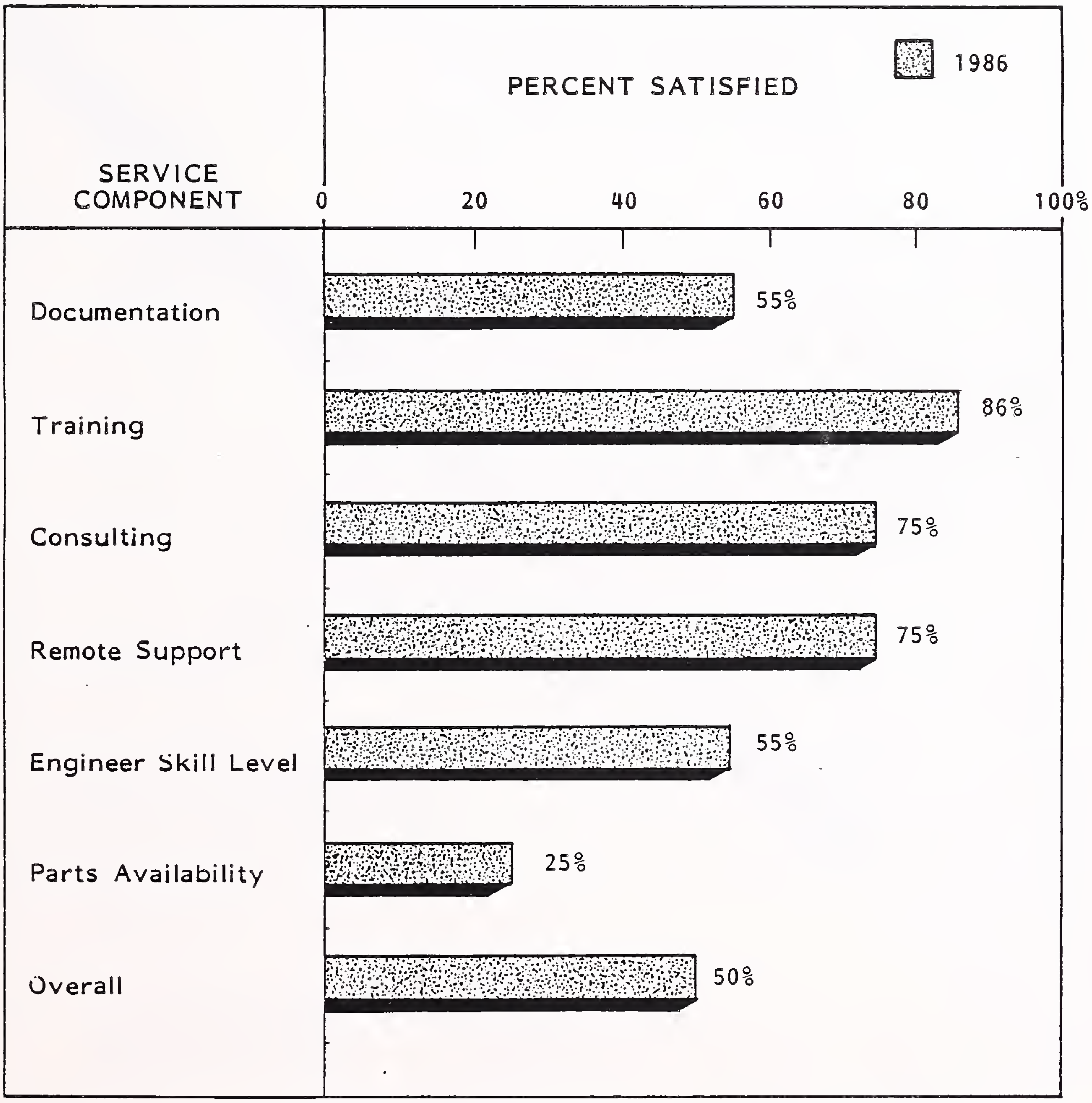
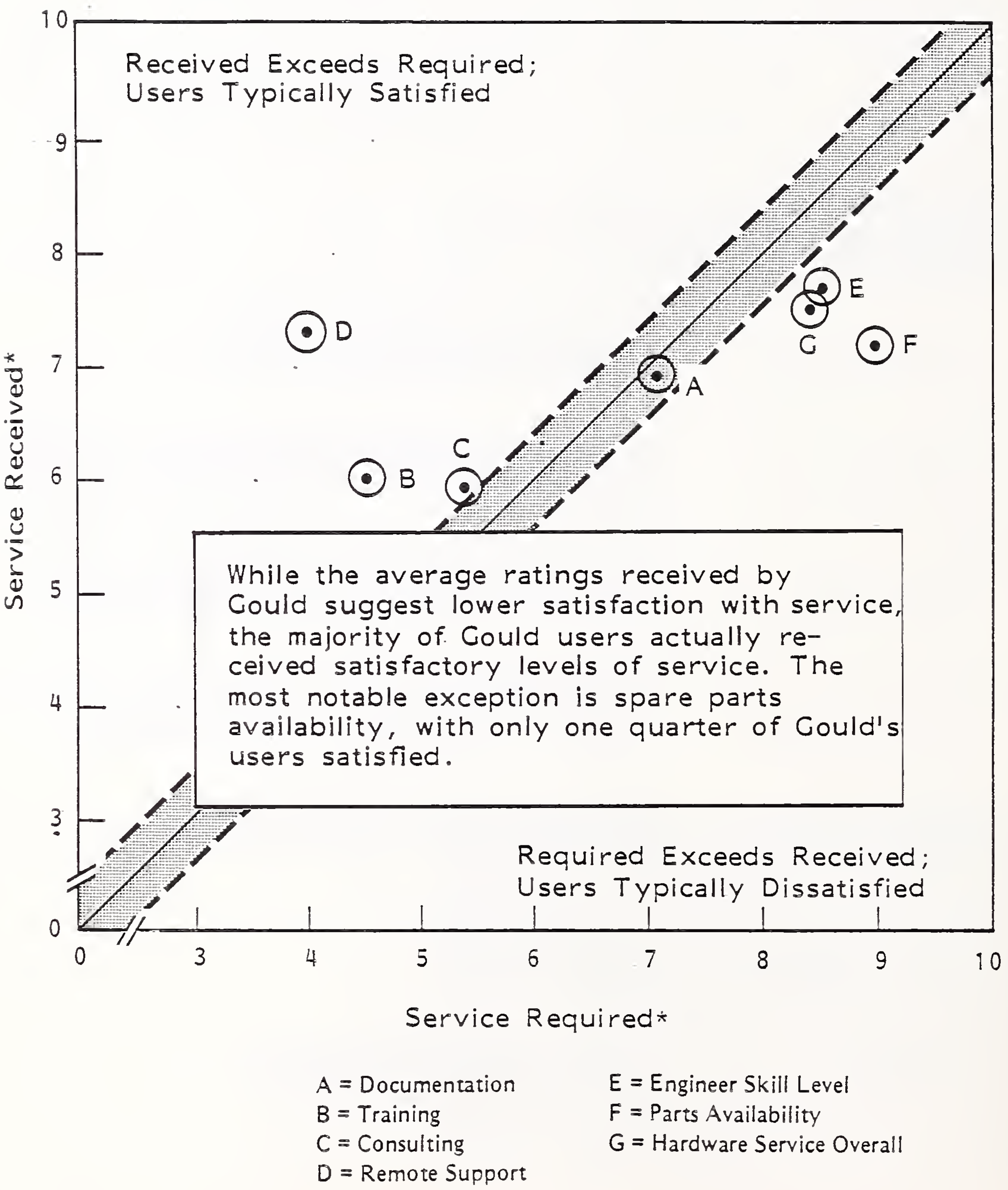


EXHIBIT III-F-3

HARDWARE SERVICES REQUIRED/RECEIVED
GOULD



While the average ratings received by Gould suggest lower satisfaction with service, the majority of Gould users actually received satisfactory levels of service. The most notable exception is spare parts availability, with only one quarter of Gould's users satisfied.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

- Exhibit III-F-4 shows that Gould also excells in the areas of consulting and remote support for systems software. An area of immediate concern should be systems software documentation, which falls well below user requirements. In fact, Exhibit III-F-5 indicates that only 20% of Gould users are satisfied with their systems software documentation. Undoubtedly, this dissatisfaction with documentation contributes to the rather low percentage of users who are satisfied with their systems software support overall. The importance of documentation cannot be overemphasized, since INPUT has found that 60% of all software problems are user related. Exhibit III-F-6 graphically demonstrates the distance between user needs and actual vendor performance in systems software documentation.

- Exhibit III-F-7 presents the actual performance marks traditionally used to judge service performance. When viewed in correlation with Exhibit III-F-8, it is obvious that Gould does an admirable job in meeting the high system availability requirements of their users. Gould exceeds the hardware response and repair time requirements of their users, and comes close to the systems software response and repair time requirements. This tends to highlight the growing concern which users are placing on spare parts availability, since it appears that the FE is arriving quickly enough, just not with the correct part.

- Exhibit III-F-9 suggests that Gould users are very willing to increase their involvement in problem determination. In many situations, this indicates a user desire to reduce their service costs. In this case, however, user willingness indicates a desire to become more involved in fault diagnosis, with the possible goal of improving the chances of the FE having the correct spare part at hand before being dispatched. In this case, the increased willingness of the user to become involved can be used by the vendor to improve service satisfaction.

- Exhibit III-F-10 indicates that almost one-third of Gould's users are experienced with third-party maintenance. Since this is the first year that Gould

EXHIBIT III-F-4

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
GOULD

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	▨ 8.3	▨ 5.8	▨ (2.5)
Training	▨ 6.4	▨ 6.2	▨ (0.2)
Consulting	5.5	6.1	0.6
Remote Support	3.6	6.7	3.1
Engineer Skill Level	▨ 7.9	▨ 7.2	▨ (0.7)
Service Overall	▨ 7.7	▨ 6.4	▨ (1.3)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.6

EXHIBIT III-F-5

USER SATISFACTION: SYSTEMS SOFTWARE SERVICE
GOULD

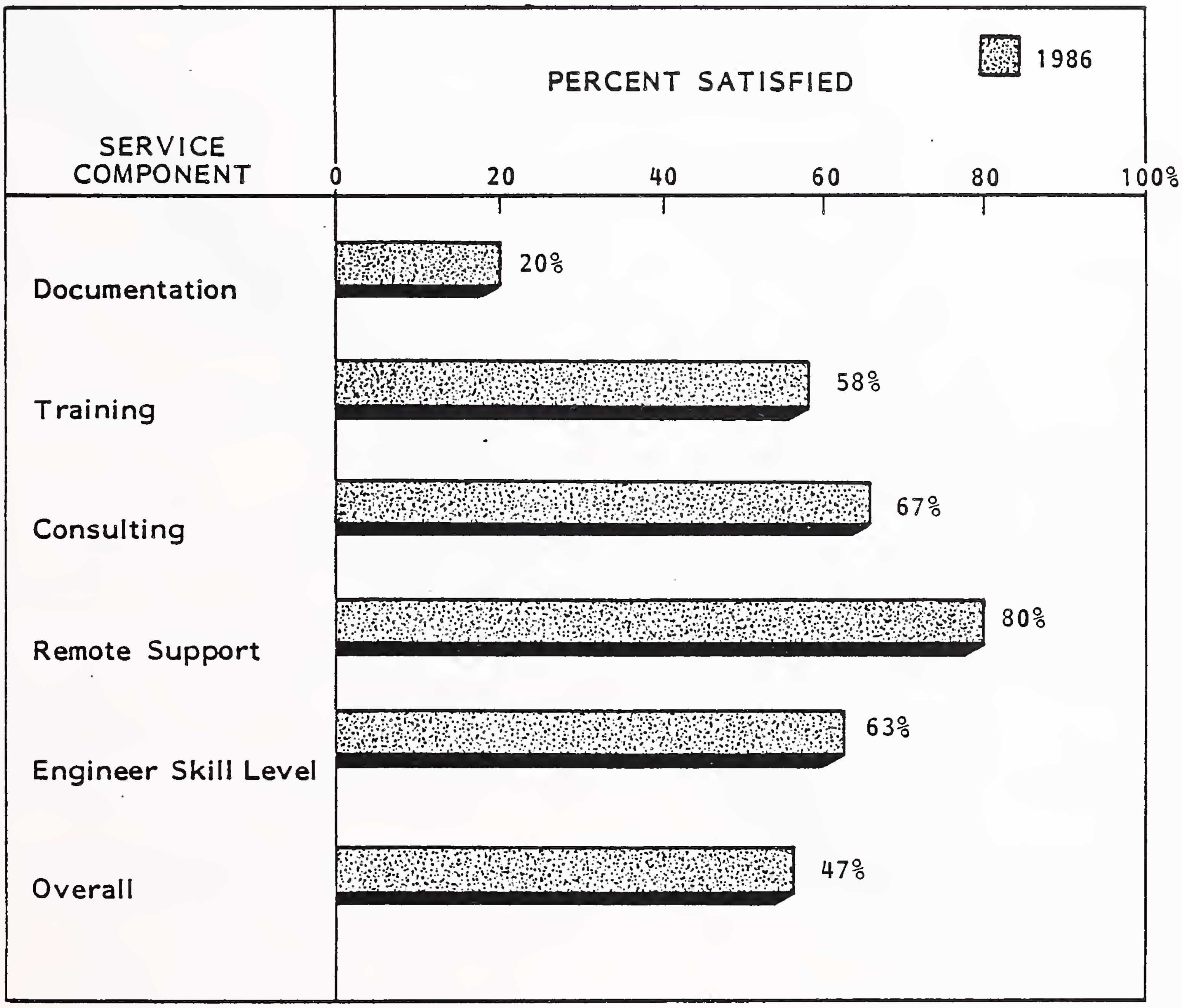
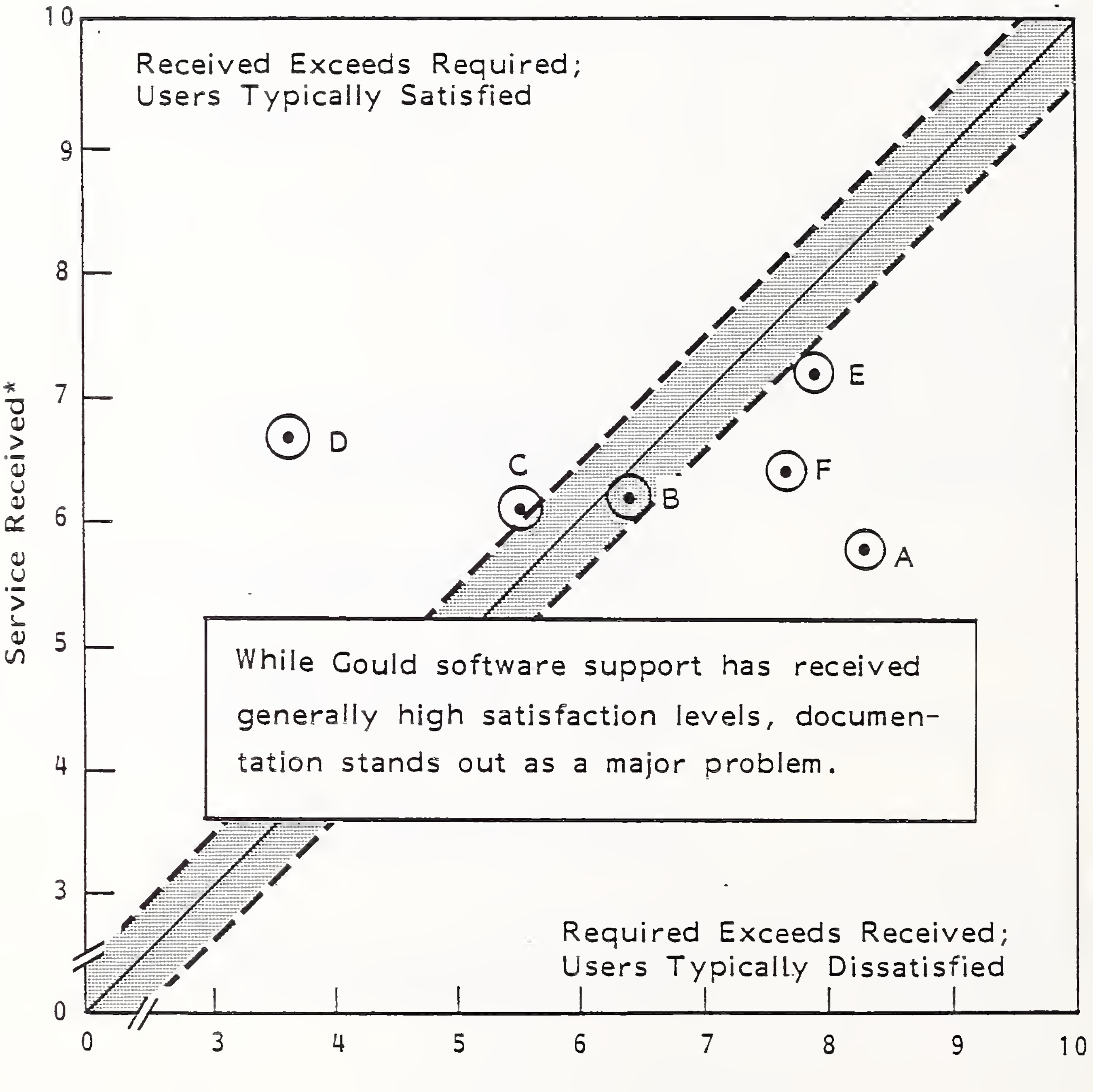


EXHIBIT III-F-6

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
GOULD



While Gould software support has received generally high satisfaction levels, documentation stands out as a major problem.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-F-7

SERVICE PERFORMANCE
GOULD

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	N/A	98.0%
Average Number of Interruptions		
Per Month (Number)	N/A	1.3
Percent Hardware Caused	N/A	52.0%
Percent Software Caused	N/A	30.0%
Average Hardware Response Time (Hours)	N/A	5.1 hr.
Average Hardware Repair Time (Hours)	N/A	5.7 hr.
Average Systems Software Response Time (Hours)	N/A	9.9 hr.
Average Systems Software Repair Time (Hours)	N/A	11.1 hr.

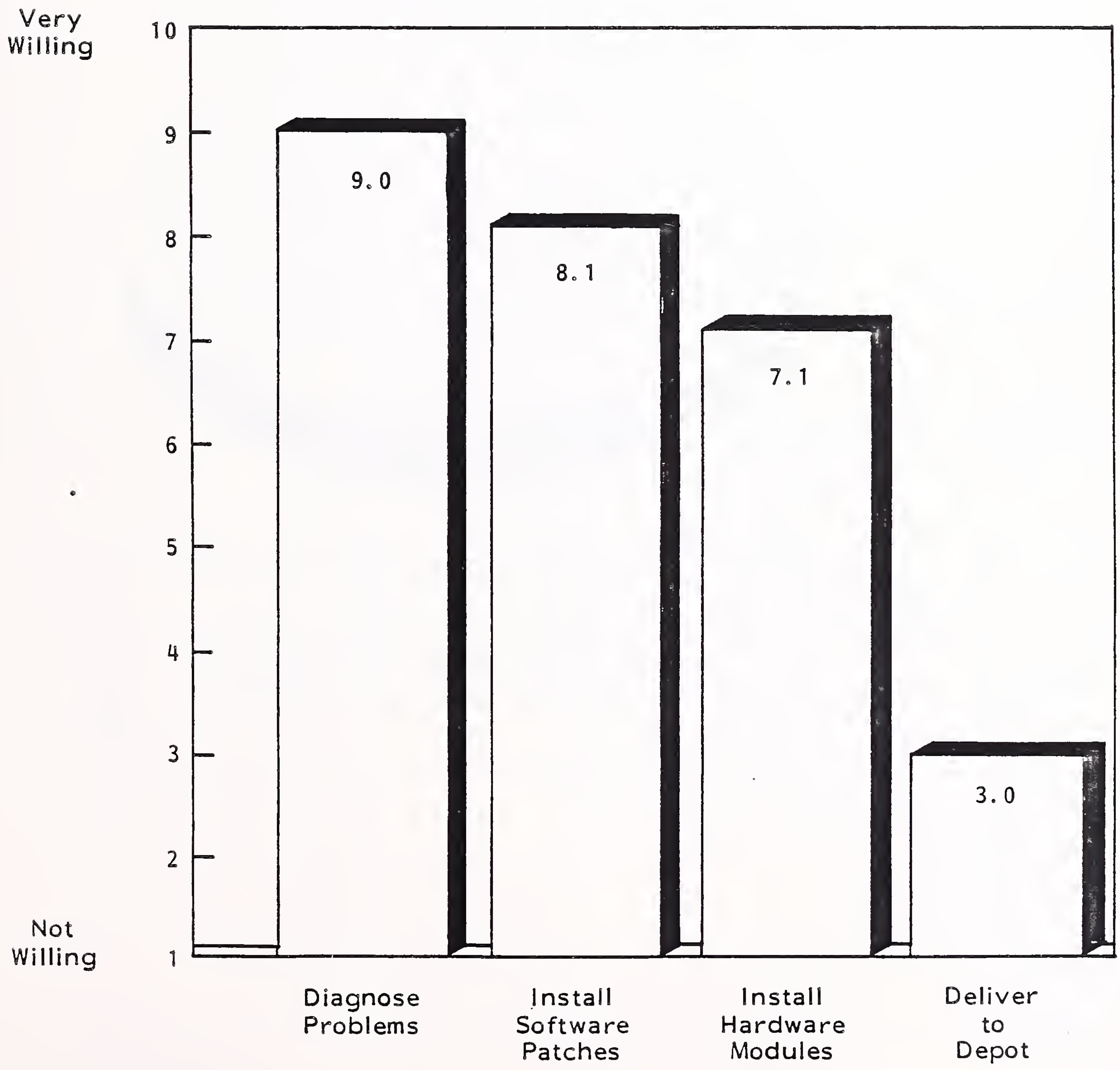
EXHIBIT III-F-8

USER EXPECTATIONS FOR SERVICE PERFORMANCE
GOULD

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent)	
		Falls Short of Expectations	Exceeds Expectations
System Availability (Percent)	97.5		1%
Hardware Response Time (Hours)	8.0		36%
Hardware Repair Time (Hours)	6.6		14%
Systems Software Response Time (Hours)	9.9	0	0
Systems Software Repair Time (Hours)	11.8	6%	

EXHIBIT III-F-9

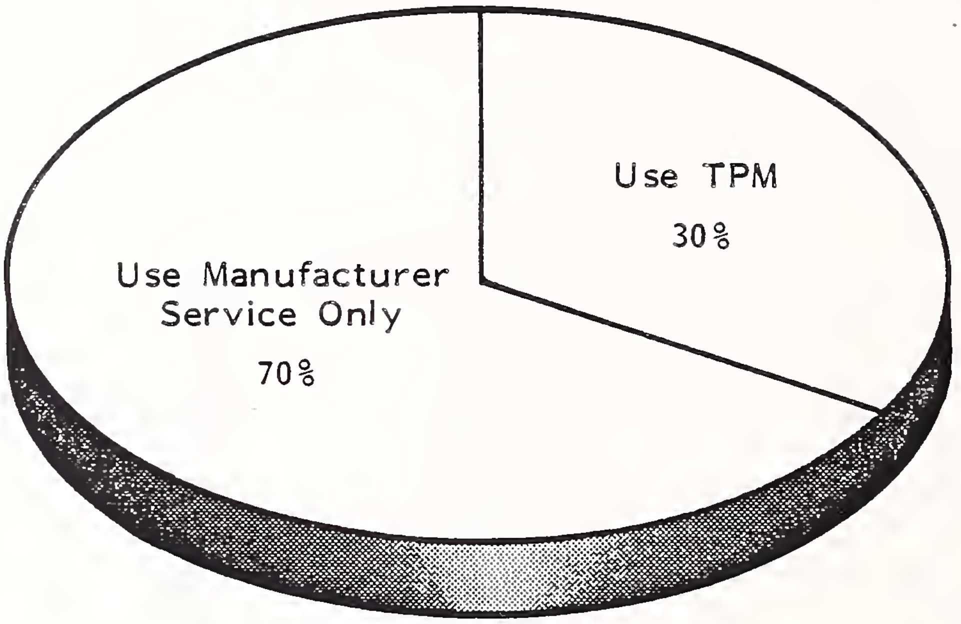
USER WILLINGNESS TO PERFORM MAINTENANCE
GOULD



* Average Standard Error: 0.2

EXHIBIT III-F-10

CURRENT TPM USE
GOULD



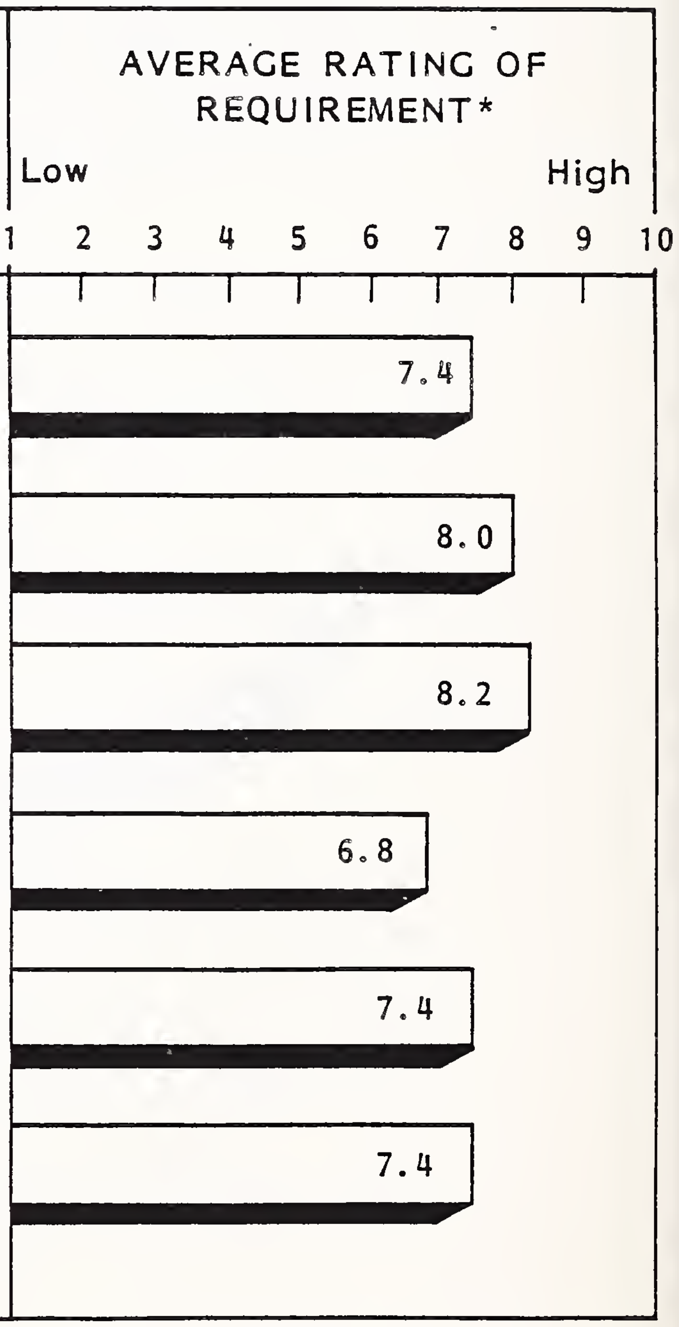
Almost one-third of all current Gould Super-mini computer users are experienced with third-party maintenance companies.

users were surveyed, it is not possible to gauge whether TPM encroachment is increasing. However, it is safe to project that TPM penetration into the superminicomputer market is growing and that Gould, as a vendor in that market, is not immune.

- Exhibit III-F-11 suggests that Gould superminicomputer users are not attracted to premium services, with the exception of non-prime hours preventive maintenance visits. Gould users recognized the importance of PM visits in preventing downtime, and thus were attracted to these additional visits as a way of maintaining high levels of system availability.

EXHIBIT III-F-11

USER REQUIREMENTS FOR EXTENDED SERVICES
GOULD



SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT*
Standby Coverage	25%	7.4
Remote Diagnostics	50	8.0
Preventive Maintenance during Non-Prime Hours	63	8.2
Deferred Response	5	6.8
Under Two-Hour Response	30	7.4
Maintenance Management	20	7.4

*Average Standard Error: 0.4

III G. IBM

- In April 1986 INPUT interviewed 25 IBM System 38 users regarding their satisfaction with the level of hardware maintenance and system software support that they received from IBM. All interviews were performed by telephone, each lasting approximately 20 minutes. Respondents were typically data processing or computer operations managers. Other than process manufacturers, which constituted 36% of the respondent base, the IBM superminicomputer sample was evenly dispersed across industry boundaries.

- Exhibit III-G-1 demonstrates that IBM has improved their already high System 38 user hardware service ratings in 1986. More significantly, IBM exceeds their users' requirement levels in virtually all hardware service areas, as shown in Exhibit III-G-2. Even in the critical areas of FE skill level--spare parts availability and overall satisfaction--IBM meets their users' high requirements (note that the standard error of the mean covers what little distance exists between user requirements and received levels for parts and overall satisfaction). Not surprisingly, IBM succeeds in satisfying the vast majority of their users' service needs for all the hardware service components tested in Exhibit III-G-3.

- IBM benefits from a reputation for service and support of their users, which has helped build the user perception of excellent service, even though actual service provided might not be that far superior to the industry norm. Where IBM has been especially successful is in their ability to identify the current needs of their users and then provide services that address those needs. And, rather than concentrating on one or two specific areas which might result in lapses in other areas, IBM has demonstrated the ability to provide the correct amount of support in all service areas. Note that in Exhibit III-G-4, IBM users place most of their satisfaction ratings above, yet relatively close to the diagonal line representing their needs. More importantly, as the service

EXHIBIT III-G-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
IBM

HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE Decline (-1.5 -1.0 -0.5)	PERFORMANCE CHANGE Improve (0.5 1.0 1.5)	USER RATING* 1985	USER RATING* 1986†
Documentation		0.5	7.7	8.2
Training		1.3	7.0	8.3
Consulting		0.4	7.7	8.1
Engineer Skill Level		0.1	8.7	8.8
Parts Availability		1.0	8.3	9.3
Service Overall		0.2	8.8	9.0

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-G-2

1986 USER HARDWARE SERVICE RATINGS
IBM

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	6.4	8.3	1.9
Training	6.6	8.3	1.7
Consulting	6.3	8.1	1.8
Remote Support	5.2	7.3	2.1
Engineer Skill Level	8.6	8.8	0.2
Parts Availability	9.5	9.3	(0.2)
Hardware Service Overall	9.2	9.0	(0.2)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-G-3

USER SATISFACTION: HARDWARE SERVICE
IBM

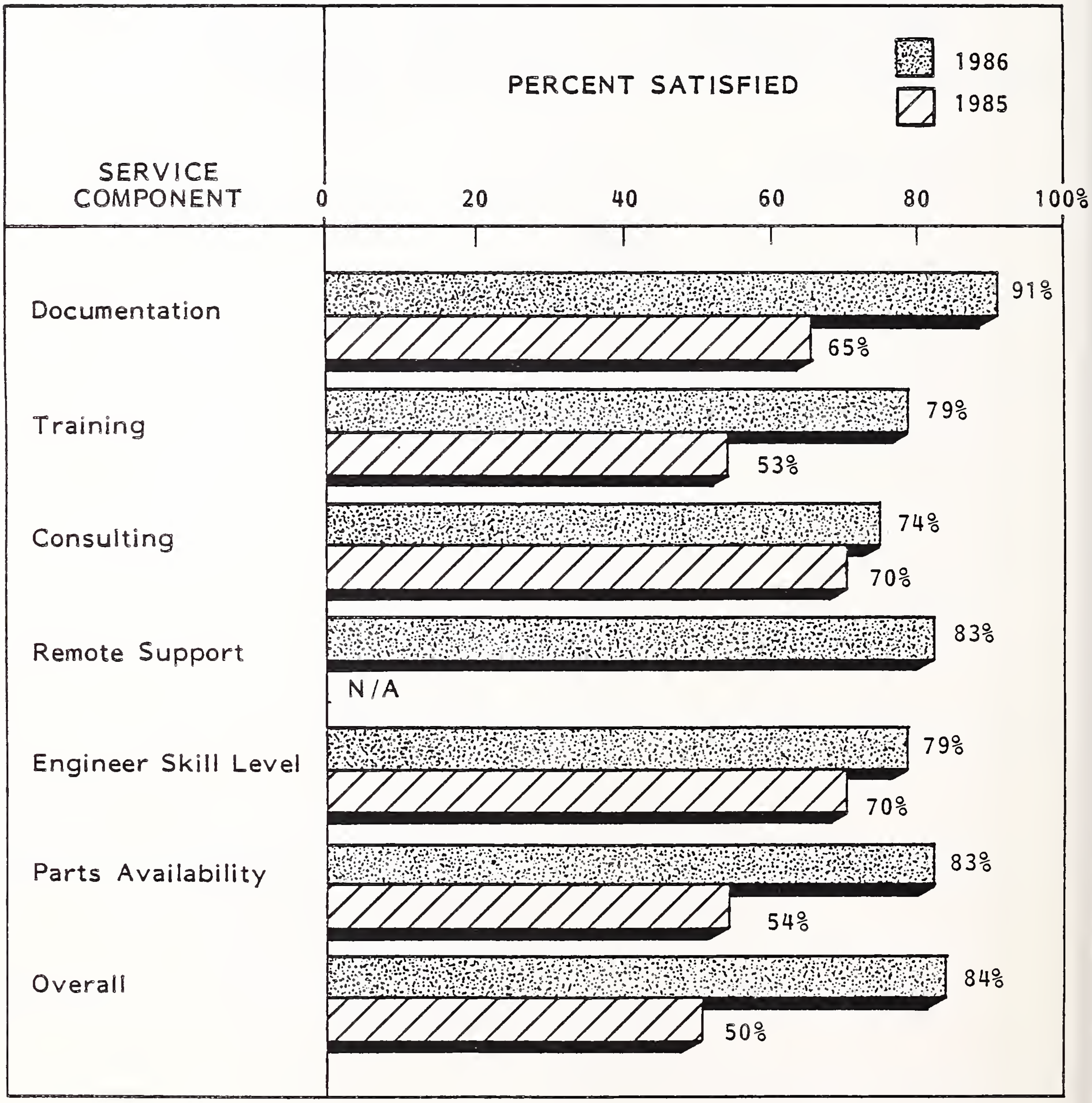
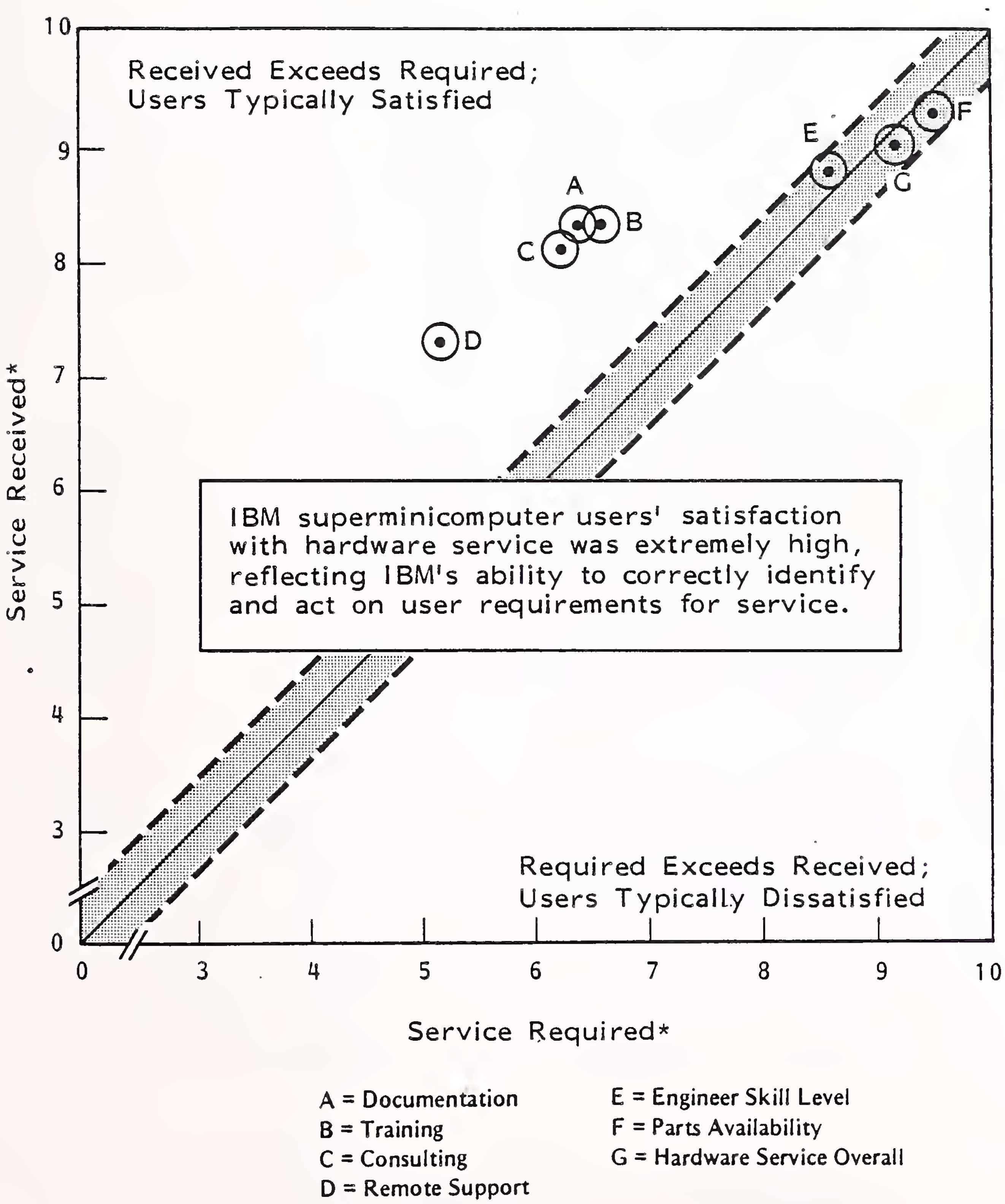


EXHIBIT III-G-4

HARDWARE SERVICES REQUIRED/RECEIVED
IBM



IBM superminicomputer users' satisfaction with hardware service was extremely high, reflecting IBM's ability to correctly identify and act on user requirements for service.

* Rating: 1 = Low, 10 = High

becomes more important to the user, and coincidentally more expensive to satisfy, IBM's ratings come even closer to that line.

- IBM System 38 service also shines in the area of systems software support. Exhibit III-G-5 shows that IBM users perceived a significant improvement in all components of software support, most notably in the area of engineer skill level, which was a weak spot last year. IBM's ability to target user requirement levels is no better illustrated than in Exhibits III-G-6 and III-G-7, which indicate that IBM is virtually dead on the mark for each service component. This is especially critical considering the rapidly increasing software support requirements that are associated with the superminicomputer market. Again, it is not surprising that the majority of IBM System 38 users report that they are satisfied with all systems software support components tested, as shown in Exhibit III-G-8.

- Exhibit III-G-9 demonstrates that IBM's actual performance is somewhat similar to industry (in this case, the superminicomputer market) standards, if not even below in certain areas. For example, the System 38's availability is below that of competitors DEC, Gould, Concurrent, Data General, and Hewlett-Packard, yet user satisfaction with system availability is very high. Response time for both hardware and software is very good, yet repair times are ordinary at best.

- The key to user satisfaction with service at IBM is that IBM successfully gauges the exact level of service necessary and supplies that level to their users. Exhibit III-G-10 shows that IBM meets or exceeds each component's user service requirement level. As a result, IBM user satisfaction in all service areas continues to remain high, even though other vendors may provide better service in one area or another. Best of all, IBM satisfies the majority of their users with little or no wasted effort (or resources).

- Not surprisingly, IBM users show little interest in increasing their own involvement in maintenance activities, as shown in Exhibit III-G-11. Further-

EXHIBIT III-G-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
IBM

SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE: Decline (-2.0 -1.5 -1.0)	PERFORMANCE CHANGE: Improve (1.0 1.5 2.0)	USER RATING*: 1985	USER RATING*: 1986†
Documentation		0.4	7.8	8.2
Training		1.4	6.8	8.2
Consulting		1.0	7.3	8.3
Engineer Skill Level		1.7	7.0	8.7
Service Overall		1.0	7.4	8.4

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.3

EXHIBIT III-G-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
IBM

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	8.2	8.2	0.0
Training	8.2	8.2	0.0
Consulting	7.5	8.3	0.8
Remote Support	6.4	6.5	0.1
Engineer Skill Level	9.3	8.7	(0.6)
Service Overall	9.1	8.4	(0.7)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-G-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICE
IBM

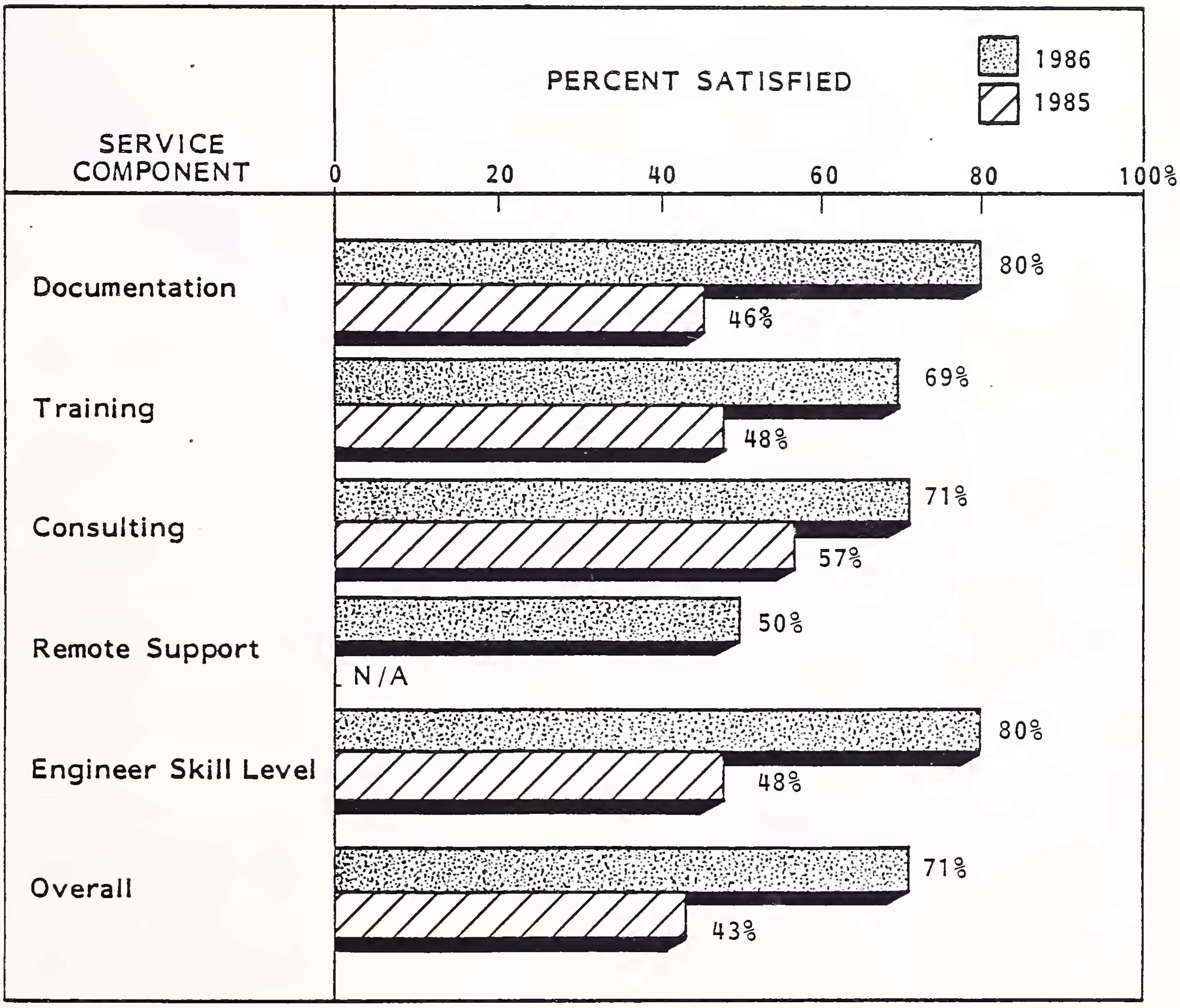
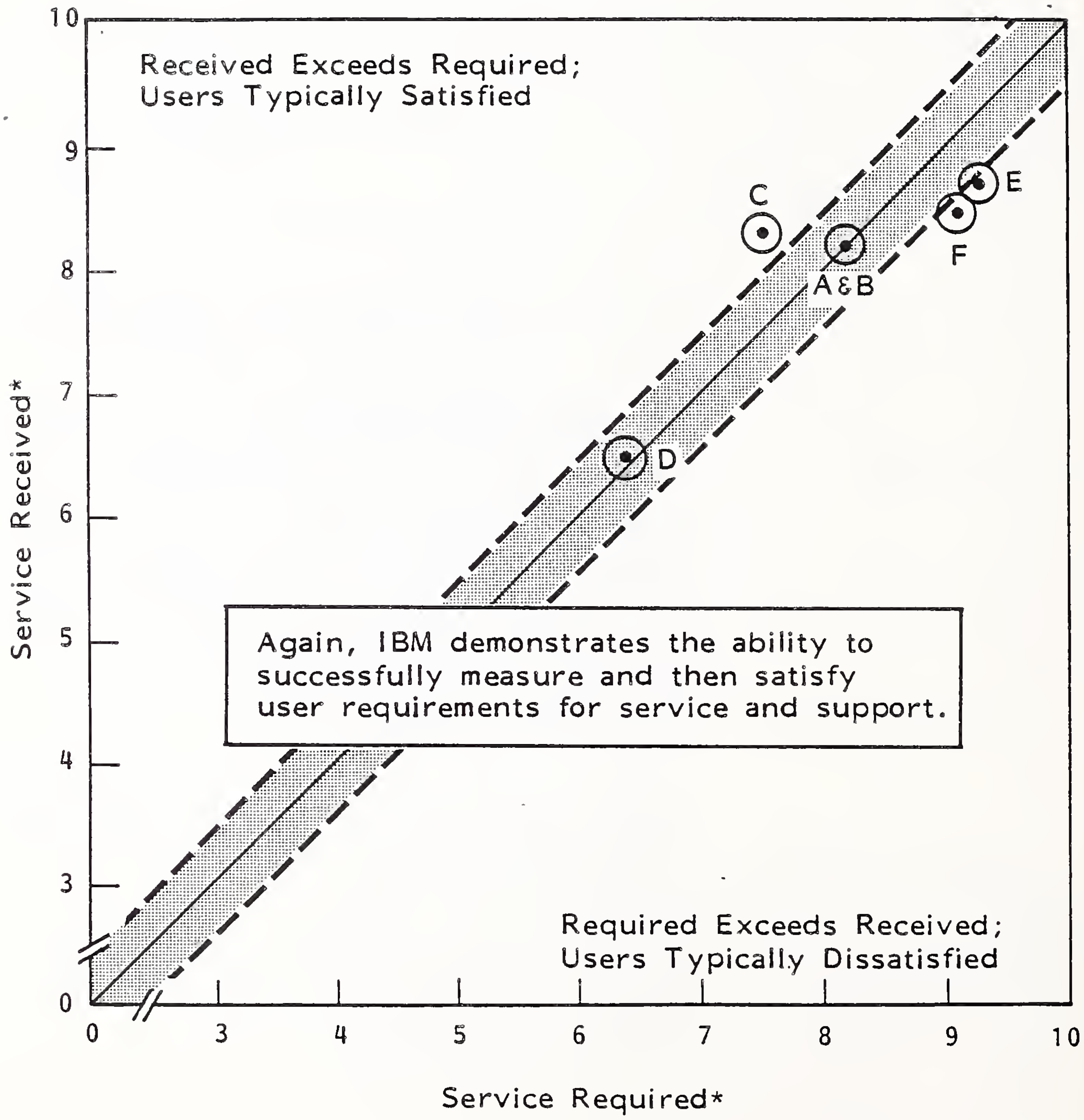


EXHIBIT III-G-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
IBM



Again, IBM demonstrates the ability to successfully measure and then satisfy user requirements for service and support.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-G-9

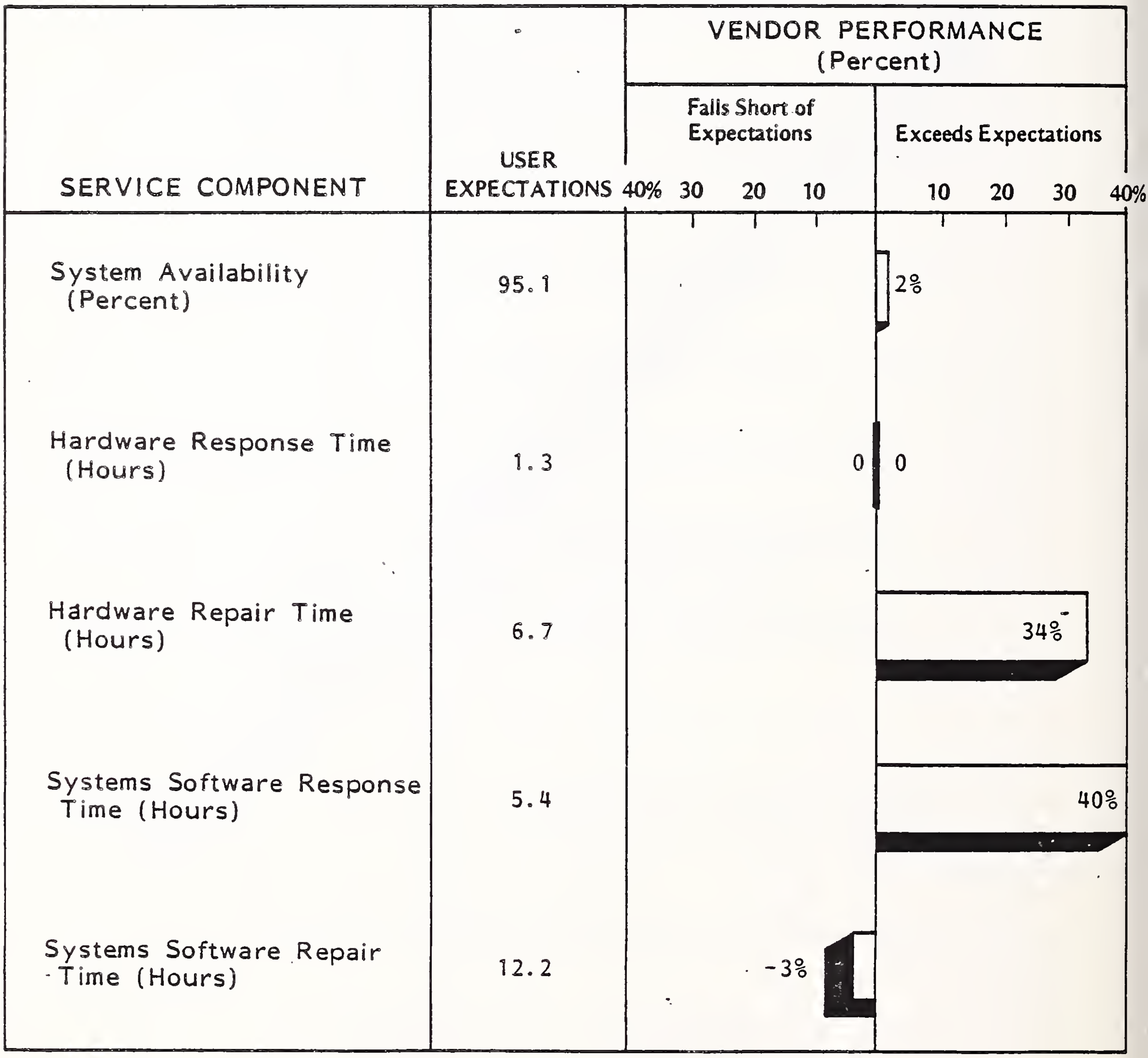
SERVICE PERFORMANCE
IBM

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	97.3%	96.8%
Average Number of Interruptions		
Per Month (Number)	0.7	0.5
Percent Hardware Caused	55.0%	67.0%
Percent Software Caused	15.0%	7.0%
Average Hardware Response Time (Hours)	1.4 hr.	1.8 hr.
Average Hardware Repair Time (Hours)	2.9 hr.	4.4 hr.
Average Systems Software Response Time (Hours)	6.2 hr.	3.2 hr.
Average Systems Software Repair Time (Hours)	9.4 hr.	12.6 hr.

EXHIBIT III-G-10

USER EXPECTATIONS FOR SERVICE PERFORMANCE

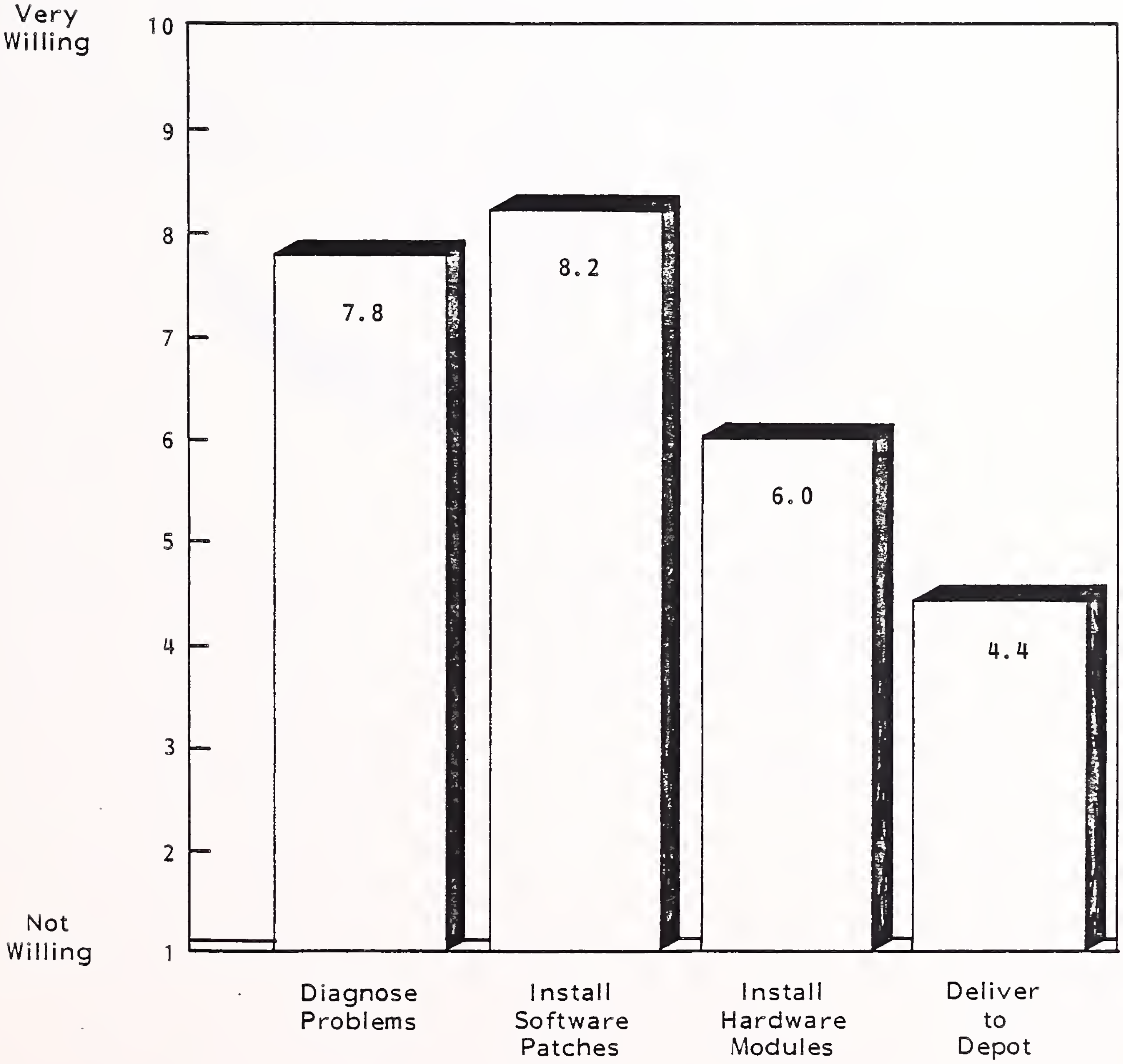
IBM



SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent)
System Availability (Percent)	95.1	2%
Hardware Response Time (Hours)	1.3	0
Hardware Repair Time (Hours)	6.7	34%
Systems Software Response Time (Hours)	5.4	40%
Systems Software Repair Time (Hours)	12.2	-3%

EXHIBIT III-G-11

USER WILLINGNESS TO PERFORM MAINTENANCE
IBM



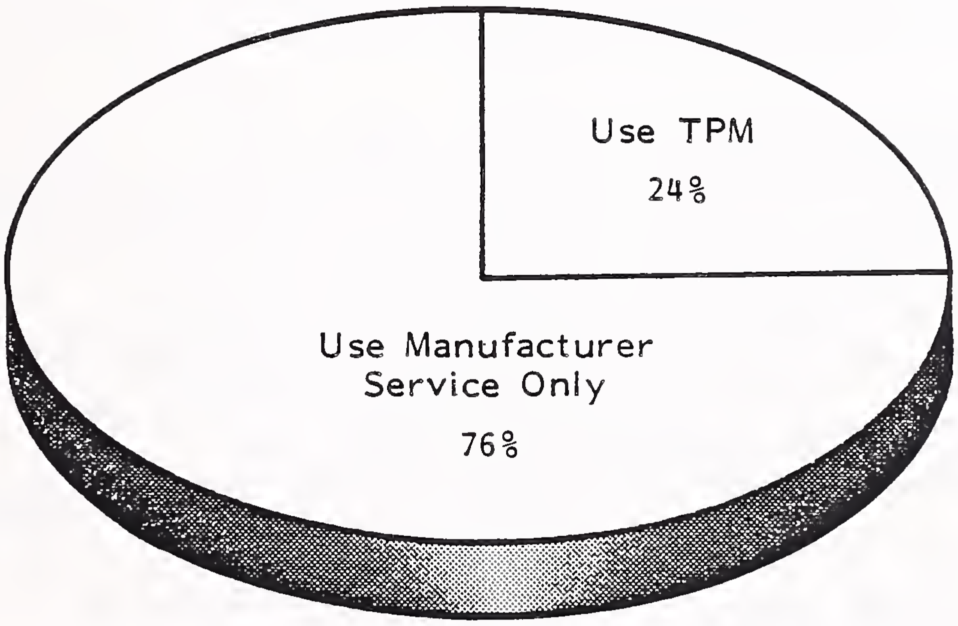
* Average Standard Error: 0.3

more, Exhibit III-G-12 suggests that IBM has been very successful in keeping users drawn to IBM service, even though the installed base of System 38 users must be large enough to attract TPM competition. The key to IBM's success is IBM's ability to target and meet their users' service and support needs.

- Exhibit III-G-13 suggests that there is considerable growth potential for premium service offerings. Over three-quarters of the System 38 users reported a requirement for standby coverage (76%), maintenance management--a form of single source service--(84%), and under two-hour response (88%). The last is puzzling, since the average IBM System 38 response time was already under two hours (1.8 hours). This curious result reflects the growing importance that users place on quick response time as a way of increasing system availability, a trend that is prompting many vendors to increase such activities as remote support and redundant systems.

EXHIBIT III-G-12

CURRENT TPM USE
IBM



A surprisingly small percentage of IBM system 38 users are experienced with TPM, most likely a reflection of high satisfaction with their current service.

EXHIBIT III-G-13

USER REQUIREMENTS FOR EXTENDED SERVICES

IBM

SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT* Low–High (1–10)
Standby Coverage	76%	8.8
Remote Diagnostics	40	7.9
Preventive Maintenance during Non-Prime Hours	56	8.1
Deferred Response	36	7.0
Under Two-Hour Response	88	9.1
Maintenance Management	84	8.5

*Average Standard Error: 0.5

III H. DATA GENERAL

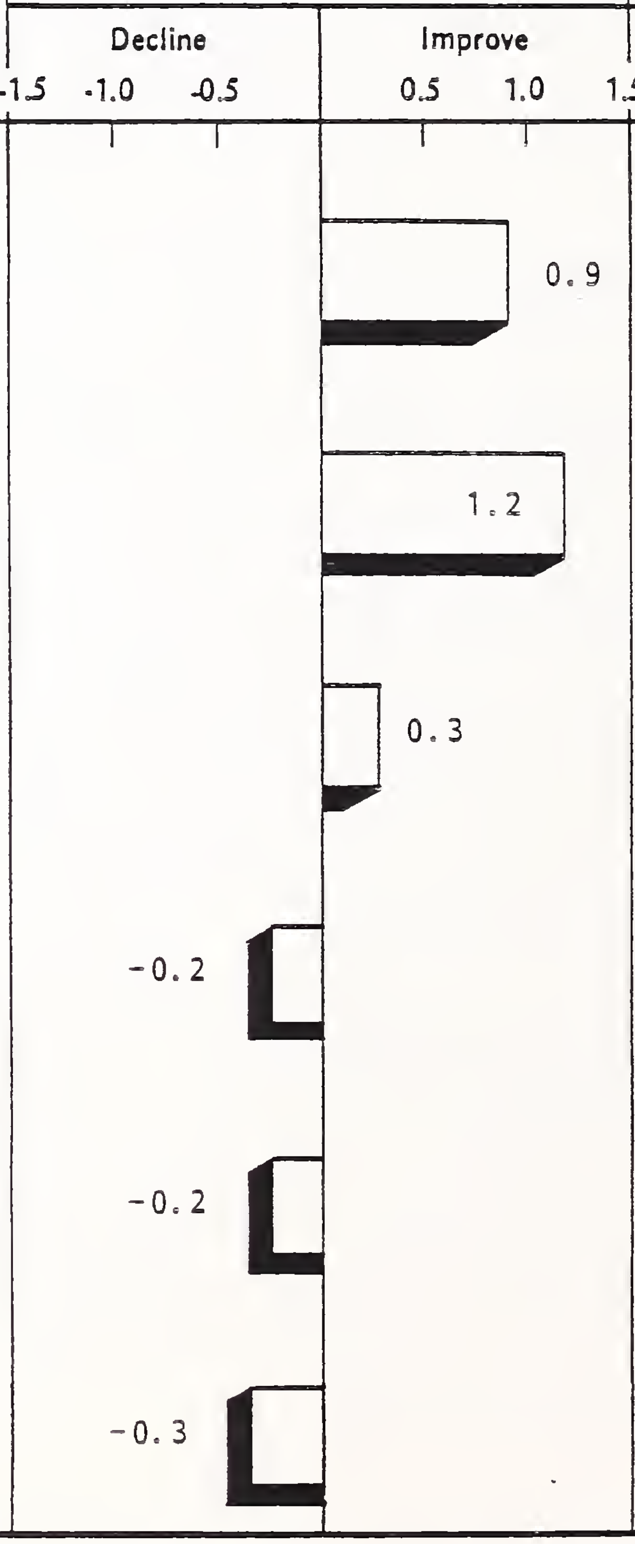
- In April and May 1986 INPUT interviewed 25 Data General MV/10000 superminicomputer users regarding their satisfaction with the service and support they received from their vendor. All interviews were performed by telephone and each interview lasted approximately 20 minutes. INPUT targeted data processing and computer operations managers as respondents. Predominant industries represented in the DG sample included education (with 28% of the sample), process manufacturing, services, medical (each with 16% of the sample), and discrete manufacturing (with 12% of the sample).

- Exhibit III-H-1 indicates that DG superminicomputer service has improved significantly in some areas like documentation and training, yet stayed about the same (considering standard errors of the mean) or slightly deteriorated in other, more important areas, like spare parts, FE skill level and overall service satisfaction. Exhibit III-H-2 shows that service in these last three areas falls below user requirements, and Exhibit III-H-3 reports that user satisfaction is also lowest in these components. The most critical problem appears to be spare parts availability, which satisfies only 39% of the DG superminicomputer sample, up slightly from last year's results. This continuation of user dissatisfaction with spares availability is surprising, considering the work that DG has done (and succeeded in, as reflected by the extremely high marks given to DG in the area of remote support) in remote diagnostics.

- Exhibit III-H-4 graphically demonstrates the inconsistency of DG superminicomputer hardware service. Note that user-reported actuals for training, consulting, and documentation far exceed the user requirement levels. At the same time, more critical areas, such as FE skill level, spare parts availability, and overall satisfaction fall below the users' requirement levels. These results suggest that DG needs to reemphasize efforts to improve user satisfaction with the more "logistics-oriented" areas, such as spares inventory management and distribution.

EXHIBIT III-H-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
DATA GENERAL



HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING* 1985	USER RATING* 1986†
Documentation	0.9	7.0	7.9
Training	1.2	7.0	8.2
Consulting	0.3	6.6	6.9
Engineer Skill Level	-0.2	8.4	8.2
Parts Availability	-0.2	7.9	7.7
Service Overall	-0.3	8.4	8.1

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-H-2

1986 USER HARDWARE SERVICE RATINGS
DATA GENERAL

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	5.6	7.5	1.9
Training	5.5	8.2	2.7
Consulting	6.5	6.9	0.4
Remote Support	7.0	7.9	0.9
Engineer Skill Level	▨ 9.1	▨ 8.2	▨ (0.9)
Parts Availability	▨ 9.1	▨ 7.7	▨ (1.4)
Hardware Service Overall	▨ 8.9	▨ 8.1	▨ (0.8)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-H-3

USER SATISFACTION: HARDWARE SERVICE
DATA GENERAL

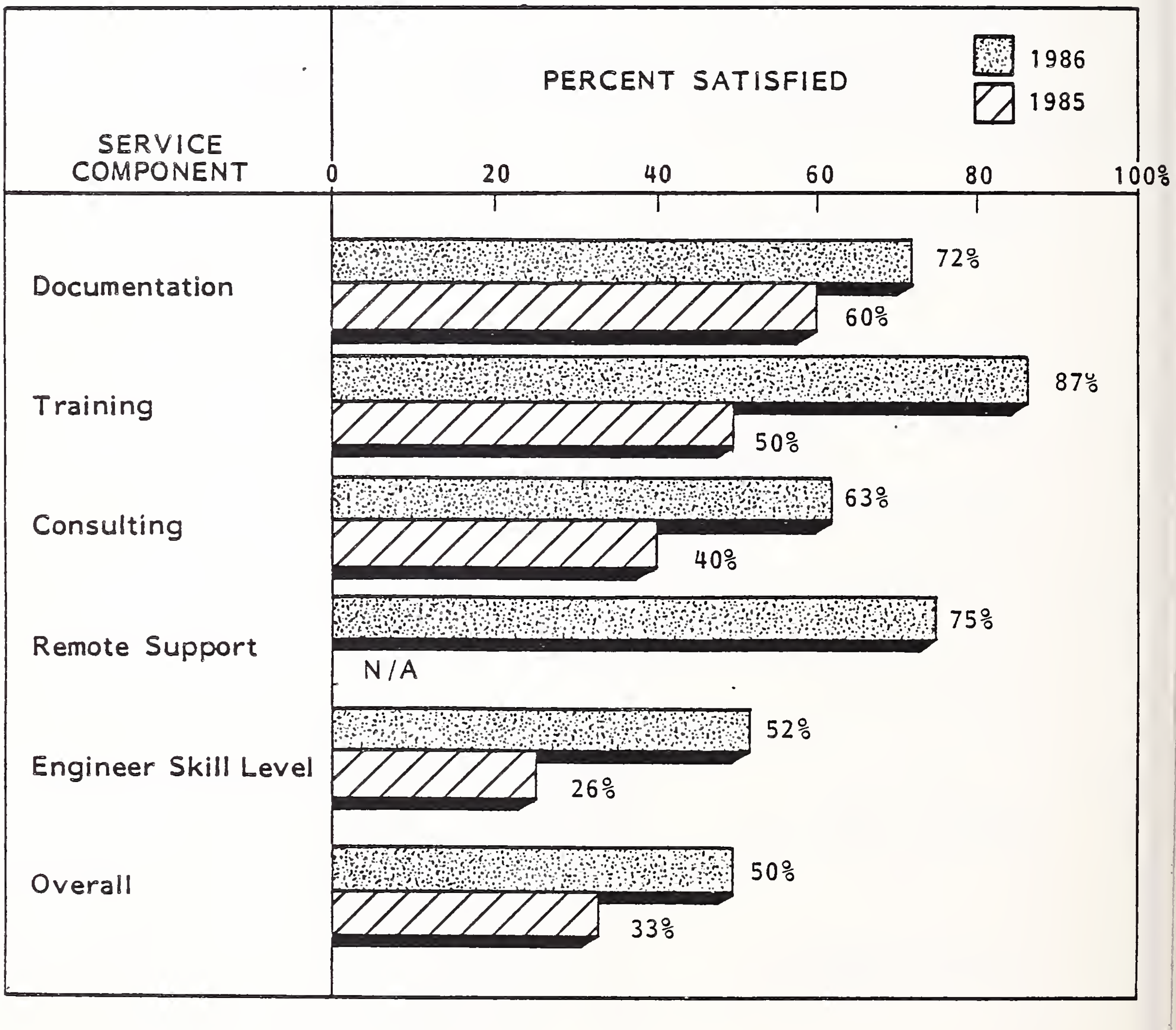
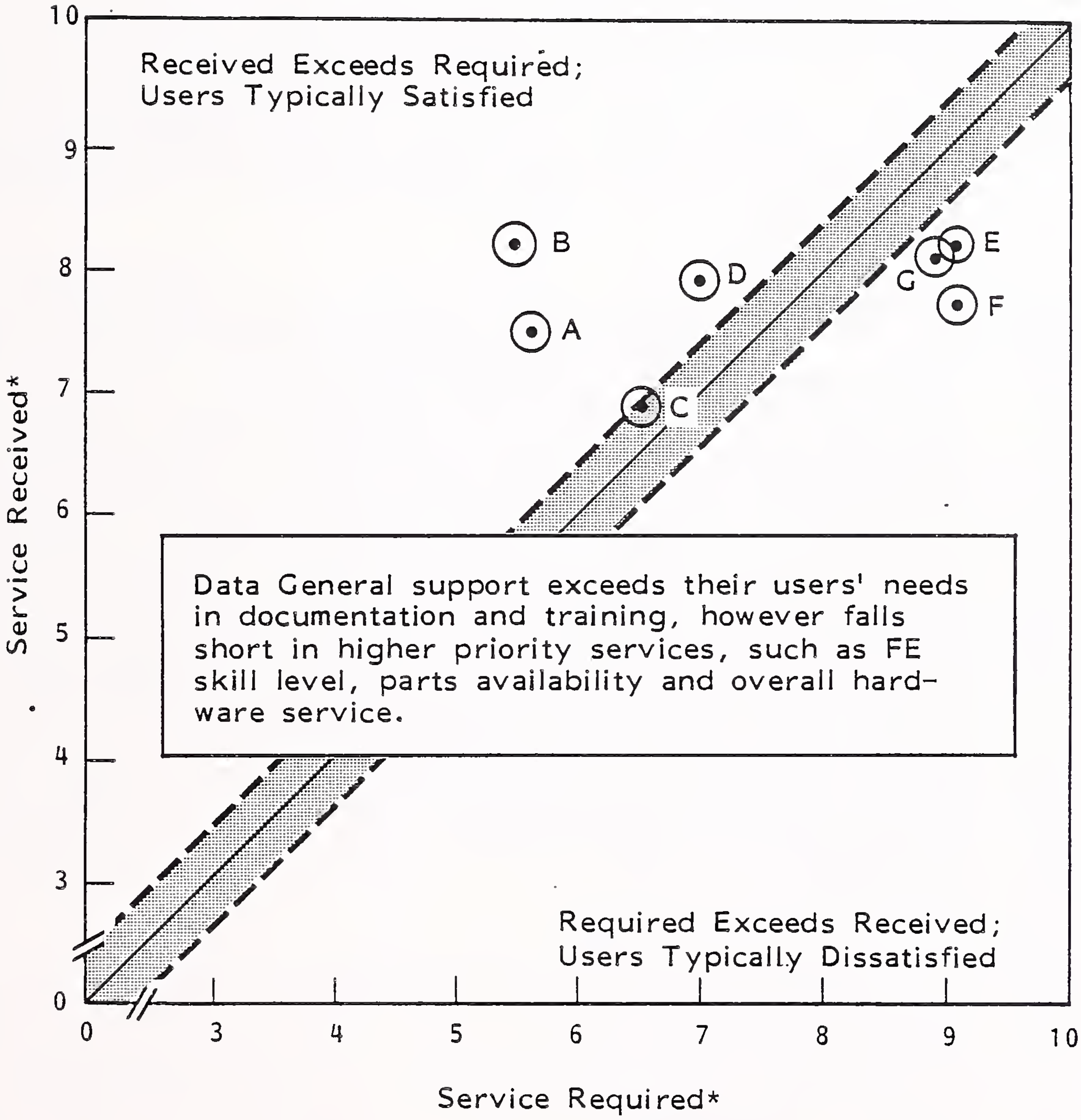


EXHIBIT III-H-4

HARDWARE SERVICES REQUIRED/RECEIVED
DATA GENERAL



Data General support exceeds their users' needs in documentation and training, however falls short in higher priority services, such as FE skill level, parts availability and overall hardware service.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

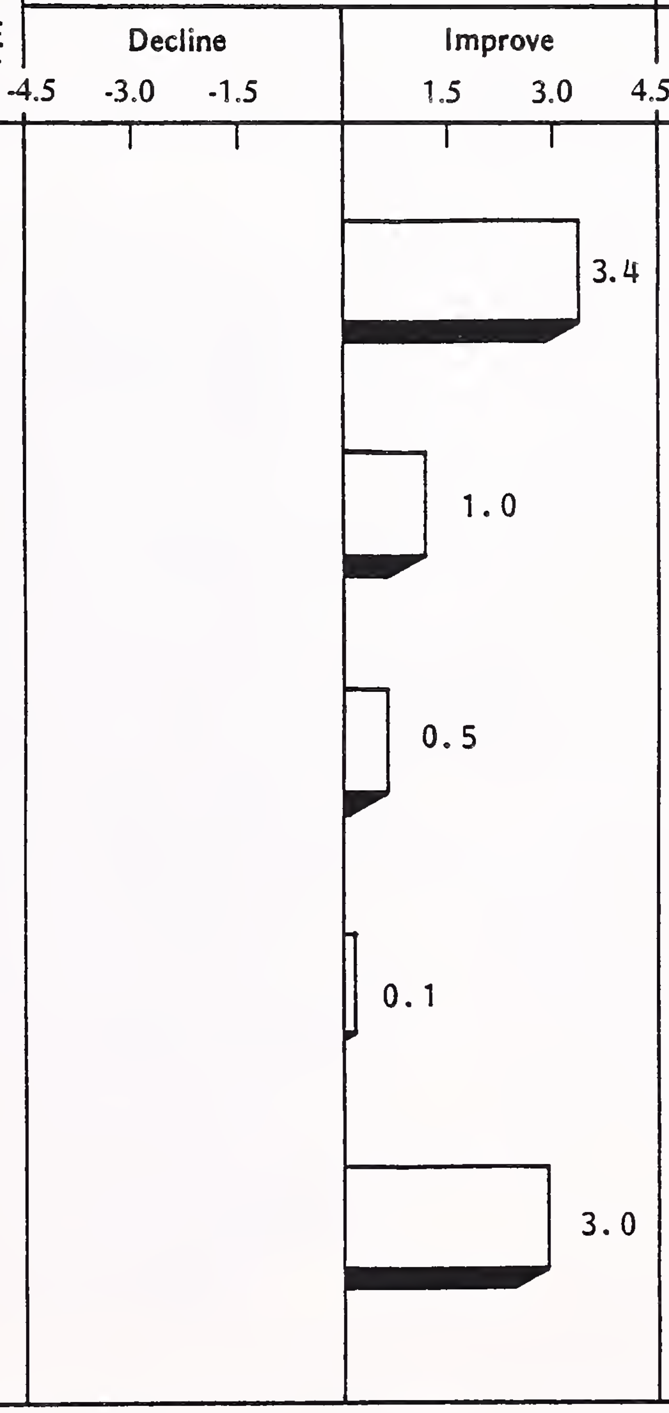
- System software support was a critical area of concern to last year's MV/10000 users. Exhibit III-H-5 indicates that DG has made improvements in most of these areas in 1986. Unfortunately, there is still a lot of room for improvement, as shown in Exhibit III-H-6. DG superminicomputer users have extremely high software support requirements, much higher than scientific/engineering superminicomputer users. Most immediate attention is needed in the area of software engineer skill level, which received an average rating well below the user requirement level. Exhibit III-H-7 further suggests that DG superminicomputer users are not satisfied with the support that they are receiving, particularly in the highest priority services, graphically shown in Exhibit III-H-8.

- Exhibit III-H-9 shows that Data General superminicomputer service performance, by more traditional measures, is very similar to last year's performance. System availability is nearly identical, hardware problem resolution time (response and repair time) is fairly close, and software problem resolution time is actually improved over last year's marks. Yet user satisfaction with the timeliness of software support is down, as shown in Exhibit III-H-10, as a result of the increasing user support requirements of DG MV/10000 users. Not surprisingly, DG superminicomputer users are extremely willing to increase their involvement in software support, as indicated in Exhibit III-H-11. This does not bode well for DG, as it will become increasingly difficult to sell additional software support to these users once they become self-reliant.

- INPUT has indicated that the superminicomputer market would become the next battlefront for third-party maintenance, and Exhibit III-H-12 supports that prediction--44% of DG MV/10000 users report experience with TPM, up slightly over last year's sample (40%). While this partly reflects the presence of "foreign" peripherals at DG sites, this also points to the potential of increased TPM penetration into DG sites if user service requirements are not met.

EXHIBIT III-H-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
DATA GENERAL



SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING*	
	Decline / Improve	1985	1986†
Documentation	3.4	4.0	7.4
Training	1.0	6.3	7.3
Consulting	0.5	6.7	7.2
Engineer Skill Level	0.1	6.5	6.6
Service Overall	3.0	4.0	7.0

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-H-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
DATA GENERAL

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	8.8	7.4	(1.4)
Training	7.6	7.3	(0.3)
Consulting	8.1	7.2	(0.9)
Remote Support	8.4	7.4	(1.0)
Engineer Skill Level	9.0	6.6	(2.4)
Service Overall	8.5	7.0	(1.5)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-H-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICE
DATA GENERAL

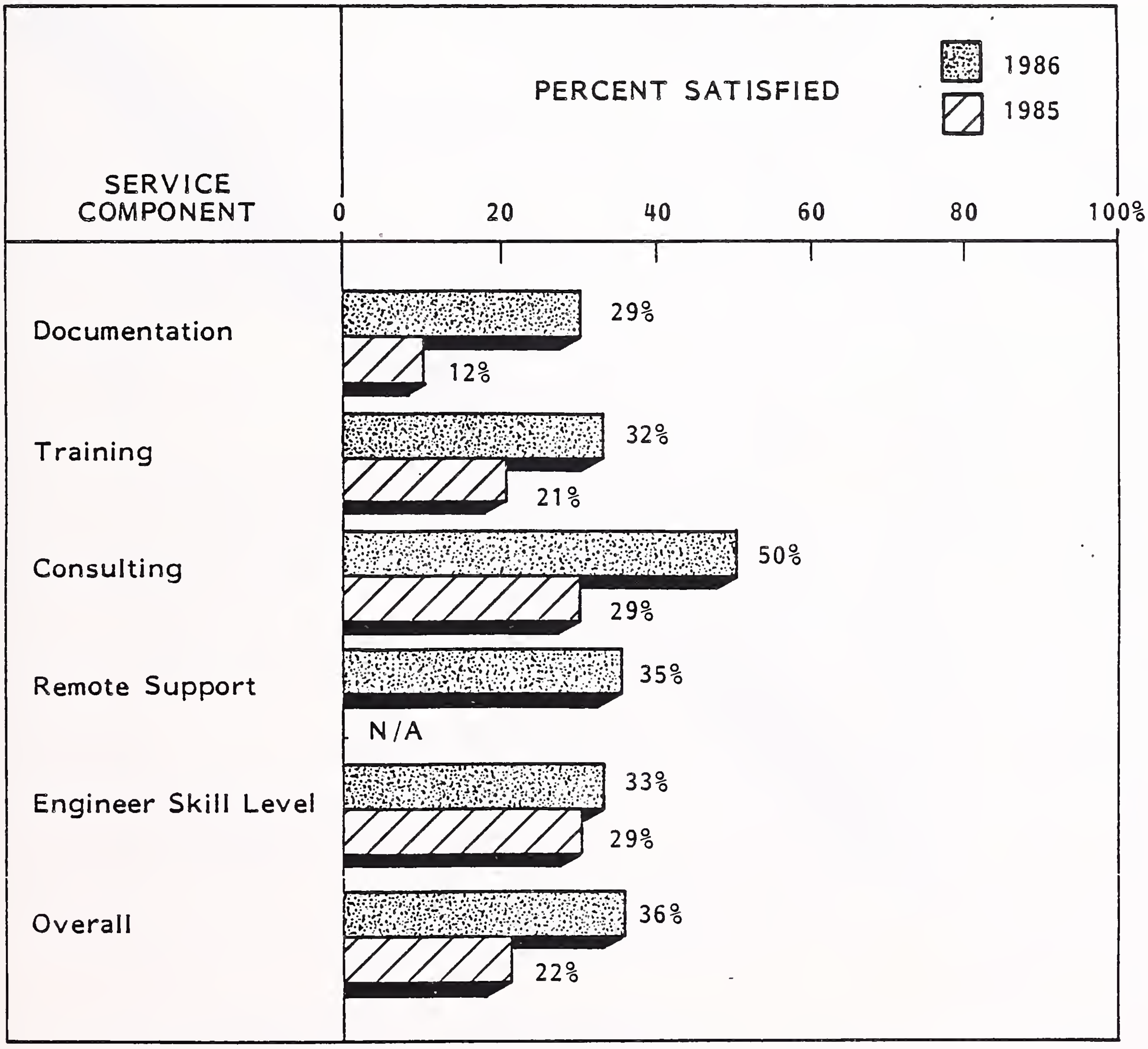
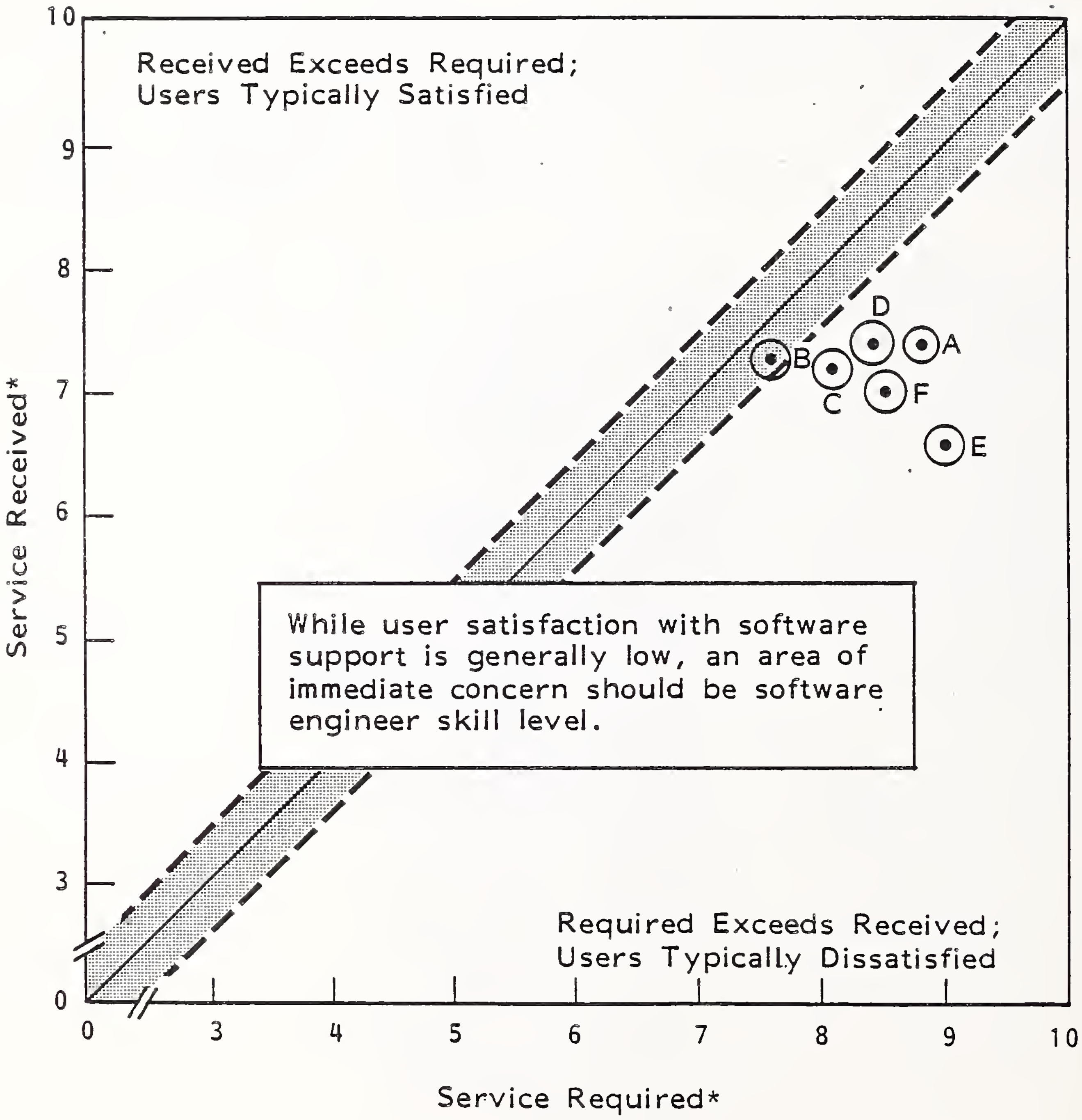


EXHIBIT III-H-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
DATA GENERAL



A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

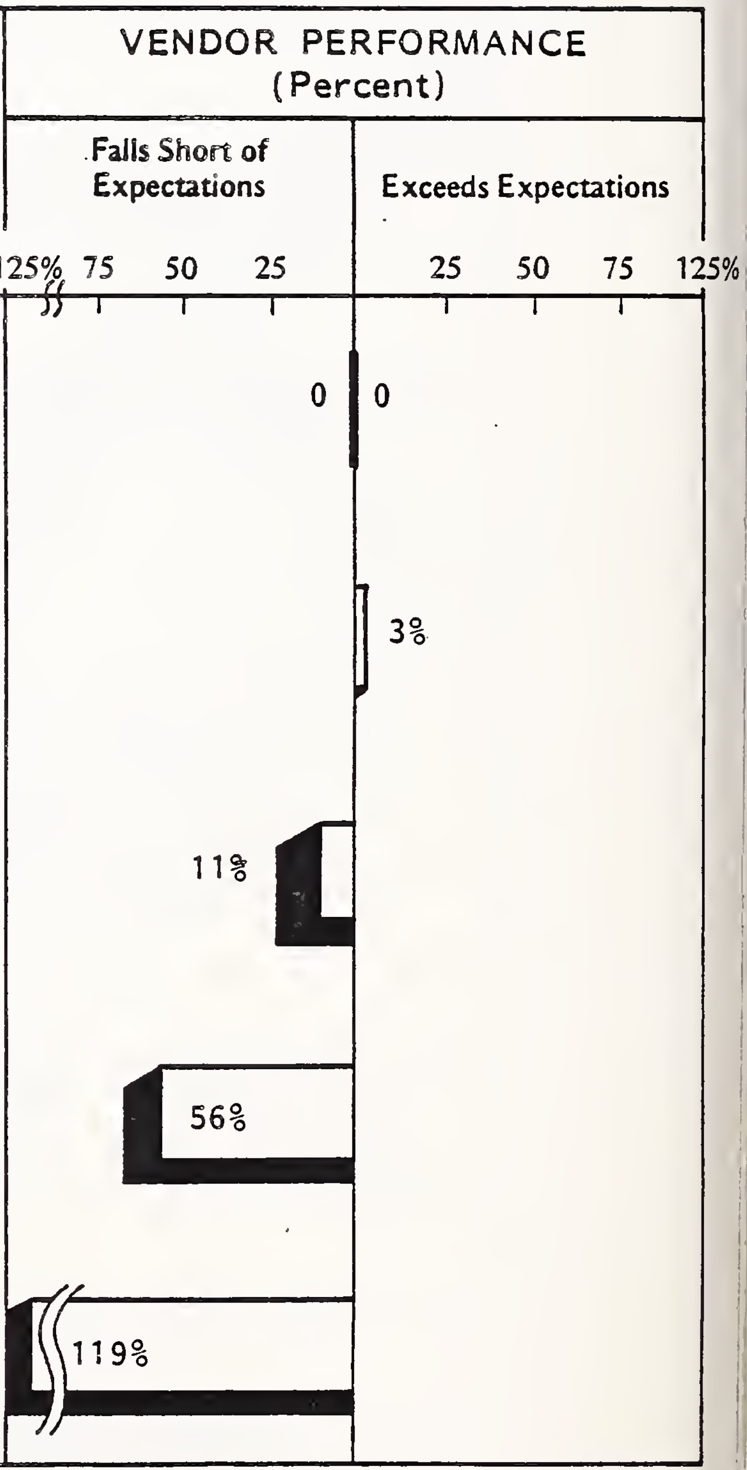
EXHIBIT III-H-9

SERVICE PERFORMANCE
DATA GENERAL

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	97.3%	97.1%
Average Number of Interruptions		
Per Month (Number)	1.9	1.4
Percent Hardware Caused	37.0%	49.0%
Percent Software Caused	46.0%	37.0%
Average Hardware Response Time (Hours)	4.2 hr.	3.0 hr.
Average Hardware Repair Time (Hours)	2.6 hr.	4.1 hr.
Average Systems Software Response Time (Hours)	2.2 hr.	3.6 hr.
Average Systems Software Repair Time (Hours)	26.0 hr.	13.4 hr.

EXHIBIT III-H-10

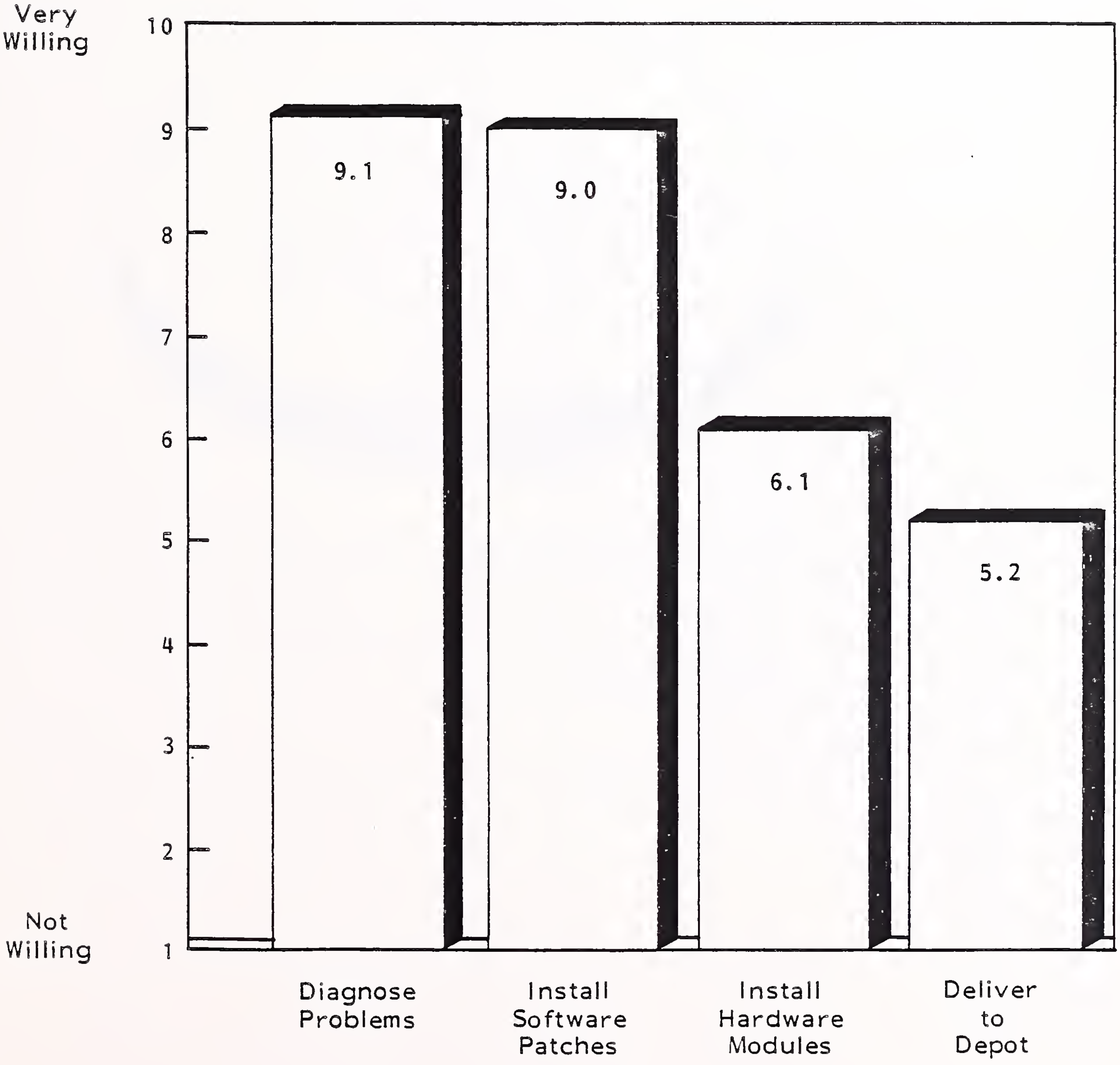
USER EXPECTATIONS FOR SERVICE PERFORMANCE
DATA GENERAL



SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent): Falls Short of Expectations	VENDOR PERFORMANCE (Percent): Exceeds Expectations
System Availability (Percent)	97.4	0	0
Hardware Response Time (Hours)	3.1		3%
Hardware Repair Time (Hours)	3.7	11%	
Systems Software Response Time (Hours)	2.3	56%	
Systems Software Repair Time (Hours)	6.1	119%	

EXHIBIT III-H-11

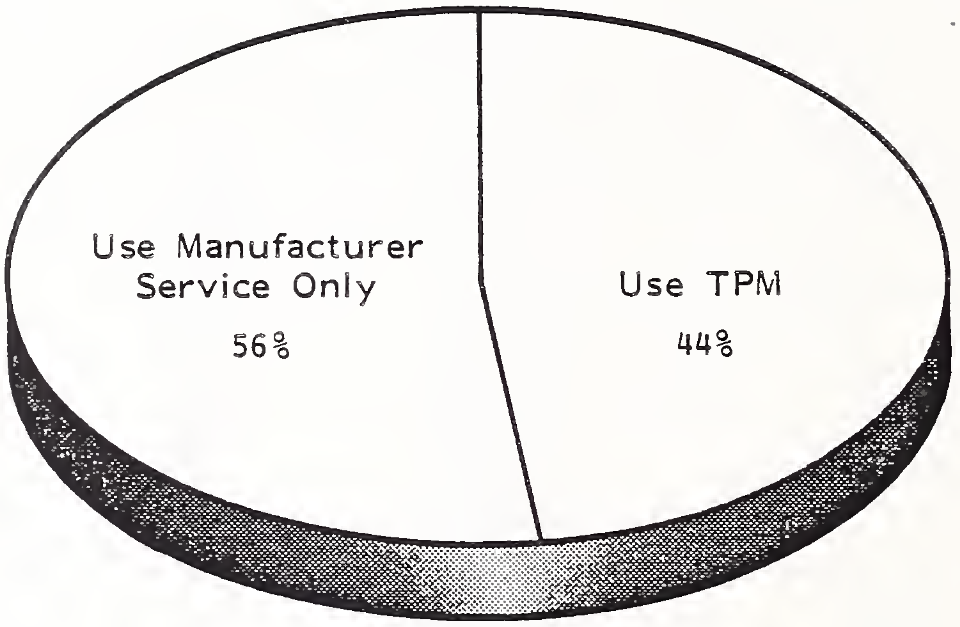
USER WILLINGNESS TO PERFORM MAINTENANCE
DATA GENERAL



* Average Standard Error: 0.3

EXHIBIT III-H-12

CURRENT TPM USE
DATA GENERAL



Forty-four percent of Data General MV/10000 users are experienced with TPM, up slightly from last year's sample.

- Exhibit III-H-13 presents DG superminicomputer user requirements for premium services. While user attraction to the majority of these services was higher than the industry norm, one service, PM's performed during non-prime hours, warrants particular attention, as the increased user interest hints at the growing multi-shift use of superminicomputers.

EXHIBIT III-H-13

USER REQUIREMENTS FOR EXTENDED SERVICES
DATA GENERAL

SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT* (Low 1 2 3 4 5 6 7 8 9 10 High)
Standby Coverage	60%	8.3
Remote Diagnostics	68	8.0
Preventive Maintenance during Non-Prime Hours	68	8.6
Deferred Response	32	7.9
Under Two-Hour Response	40	7.7
Maintenance Management	48	7.9

*Average Standard Error: 0.5

III I. DIGITAL EQUIPMENT CORPORATION

- In April 1986 INPUT interviewed 25 DEC VAX 11/7XX superminicomputer users concerning the quality of hardware maintenance and software support that they received from their vendor. All interviews were conducted by telephone and each lasted approximately 20 minutes. Respondents typically were directors or managers of data processing. The sample was weighted by two industries, services (which accounted for 36% of the sample) and discrete manufacturers (which made up an additional 32% of the sample). The rest of the sample were companies from the following industries: process manufacturing, education, and federal government.

- Exhibit III-I-1 demonstrates that DEC superminicomputer hardware service performance stayed relatively constant (considering the standard error of the mean) from 1985 to 1986. Exhibit III-I-2 presents a less favorable view of DEC hardware service performance, however, since the level of service received falls well below user requirements in the most critical service areas of FE skill level, spare parts availability, and overall satisfaction with hardware service. Not surprisingly, user satisfaction with these three areas is lowest, as shown in Exhibit III-I-3. In fact, DEC satisfies less than one-half of their superminicomputer users in the areas of parts availability and hardware service overall. Exhibit III-I-4 graphically demonstrates the gap between user requirements and actual service received in these high requirement areas.

- Systems software support is a slightly bigger problem for DEC. While DEC made significant improvements in the quality of system software documentation (as shown in Exhibit III-I-5), users perceived a decline in the ability of DEC software engineers in 1986. Exhibit III-I-6 indicates that while DEC users do not have exceptionally high service requirements in any one area, DEC comes close to meeting user requirements in only one service area (systems software training). While DEC users have been relatively accepting of this, as indicated by satisfaction percentages shown in Exhibit III-I-7, note

EXHIBIT III-I-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
DEC

HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE Decline (-1.5 -1.0 -0.5)	PERFORMANCE CHANGE Improve (0.5 1.0 1.5)	USER RATING* 1985	USER RATING* 1986†
Documentation		0.1	6.7	6.8
Training		0.5	5.5	6.0
Consulting	-0.5		6.2	5.7
Engineer Skill Level	-0.2		8.0	7.8
Parts Availability		0.5	7.0	7.5
Service Overall	-0.4		8.1	7.7

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-I-2

1986 USER HARDWARE SERVICE RATINGS
DEC

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	6.7	6.8	0.1
Training	6.2	6.0	(0.2)
Consulting	6.3	5.7	(0.6)
Remote Support	7.7	7.6	(0.1)
Engineer Skill Level	8.8	7.8	(1.0)
Parts Availability	9.0	7.5	(1.5)
Hardware Service Overall	8.7	7.7	(1.0)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-I-3

USER SATISFACTION: HARDWARE SERVICE
DEC

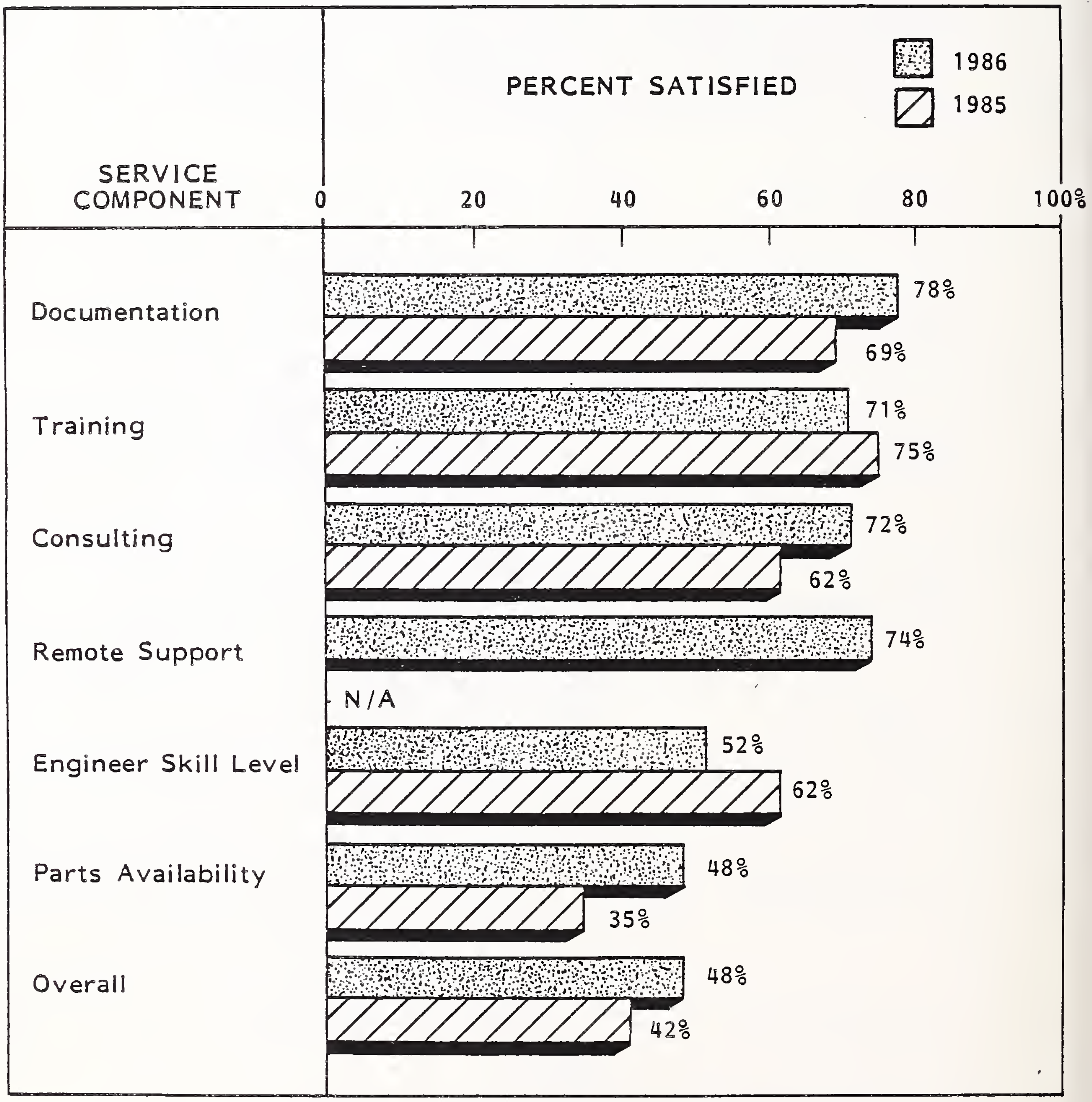
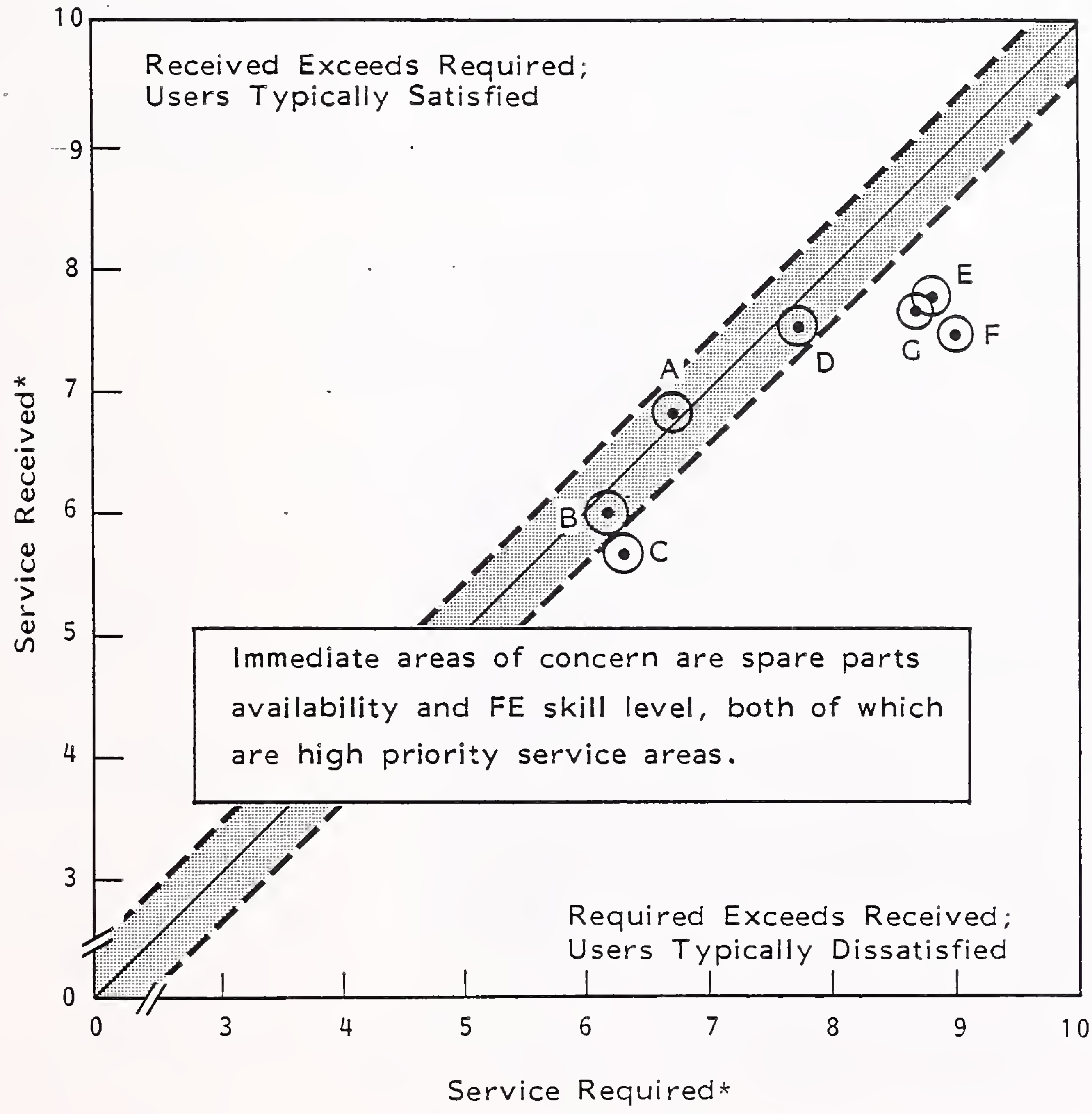


EXHIBIT III-1-4

HARDWARE SERVICES REQUIRED/RECEIVED
DEC



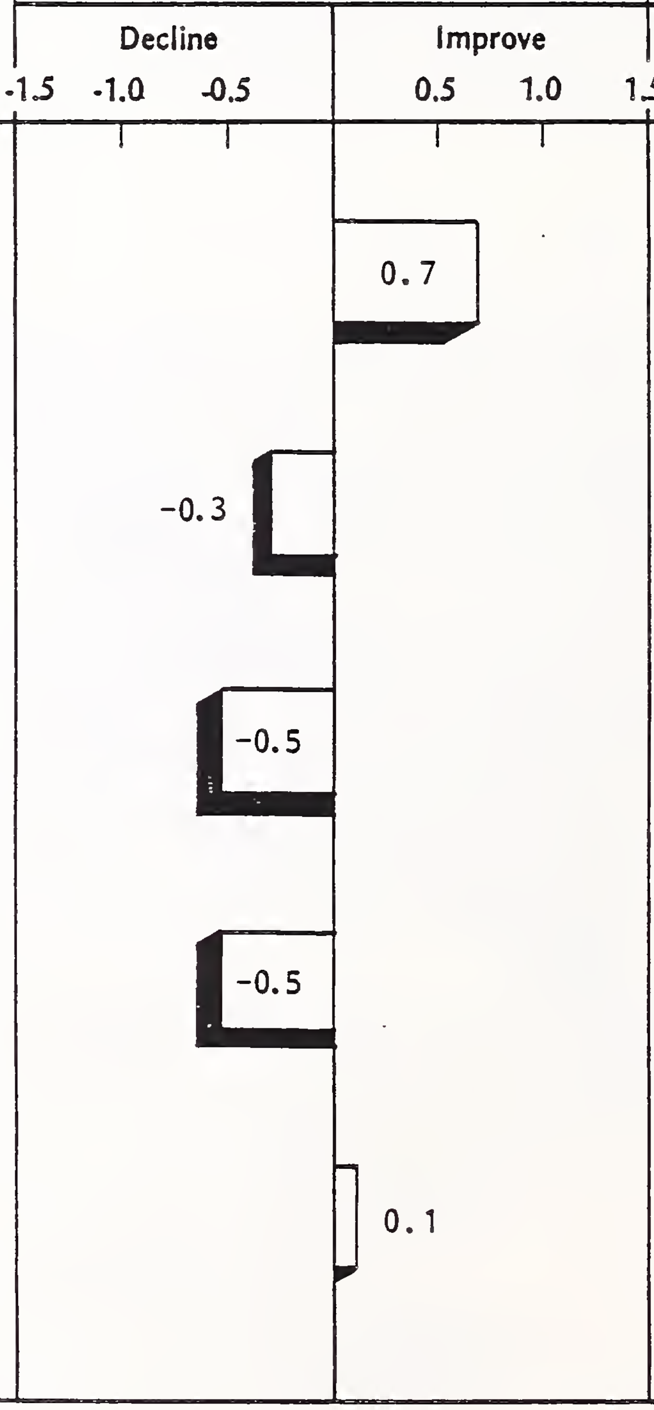
Immediate areas of concern are spare parts availability and FE skill level, both of which are high priority service areas.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-1-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
DEC



SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING* 1985	USER RATING* 1986†
Documentation	0.7	7.0	7.7
Training	-0.3	6.7	6.4
Consulting	-0.5	6.6	6.1
Engineer Skill Level	-0.5	7.5	7.0
Service Overall	0.1	6.8	6.9

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-I-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
DEC

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	8.6	7.7	(0.9)
Training	6.5	6.4	(0.1)
Consulting	6.9	6.1	(0.8)
Remote Support	7.3	6.3	(1.0)
Engineer Skill Level	8.3	7.0	(1.3)
Service Overall	7.9	6.9	(1.0)

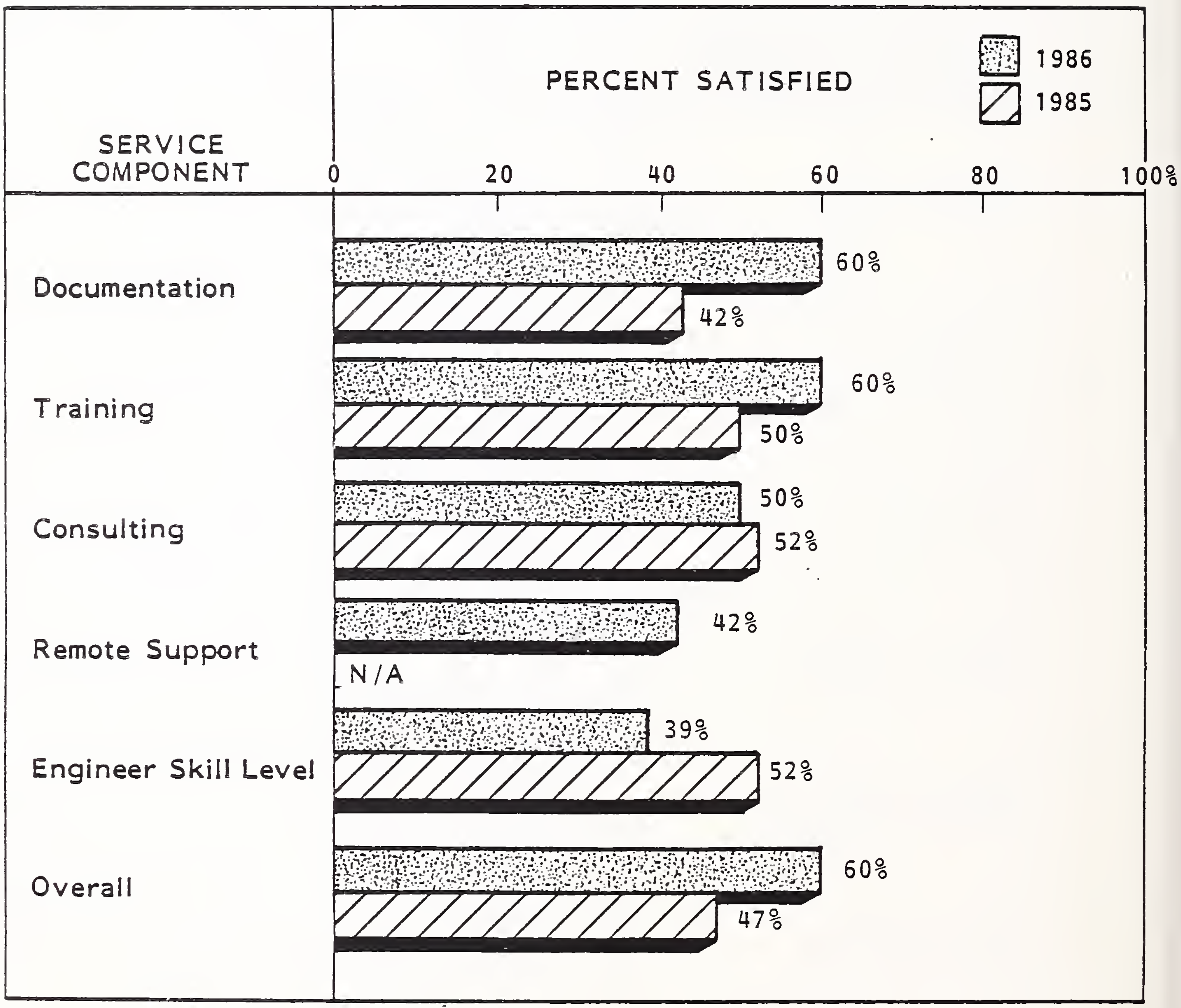
▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-I-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICE
DEC



the significant drop in the percentage of DEC superminicomputer users who are satisfied with the skill level of their software engineer. Exhibit III-I-8 graphically shows the gap between user requirements and vendor actuals, particularly in the area of software engineer skill level.

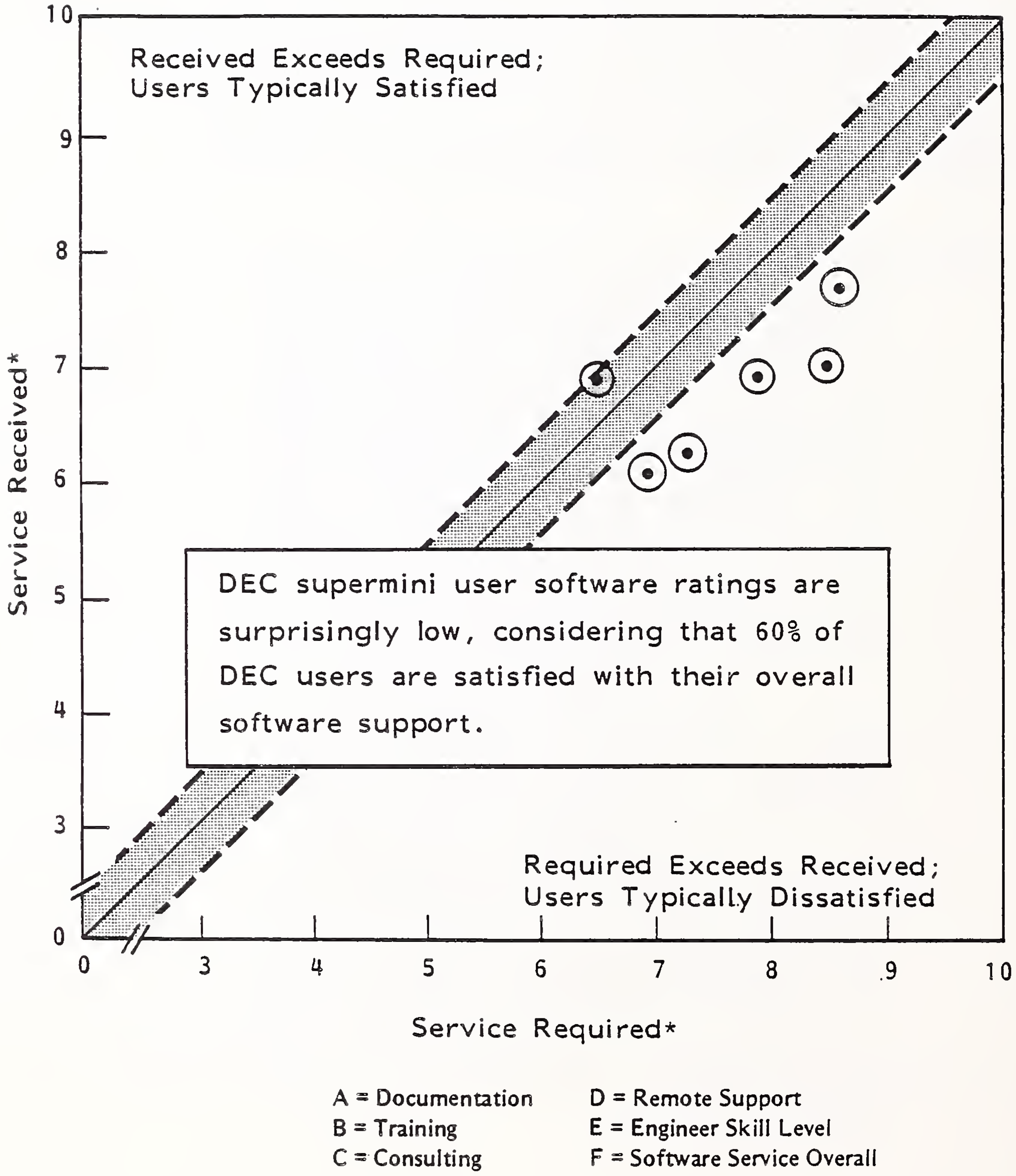
- Exhibit III-I-9 indicates that DEC has improved system availability, both by improving product reliability (as indicated by a significant drop in the number of system interruptions) and by speeding up both hardware and software total problem resolution times. However, user software support requirements are growing very rapidly in the superminicomputer market, and Exhibit III-I-10 demonstrates that while software problem resolution improved, user requirements for problem resolution increased at a faster rate.

- Digital has been very effective in the marketing of their extensive support offerings. In most cases, their service menu has emphasized vendor-supplied services that tend to lock a customer into increased interaction with the vendor. Therefore, it is not surprising that DEC superminicomputer users are not extremely attracted to increasing their involvement in the servicing of their own equipment, as demonstrated in Exhibit III-I-11. In fact, Exhibit III-I-12 indicates that DEC users are increasingly attracted to additional premium service offerings, like non-prime PM visits, remote diagnostics, and maintenance management contracts.

- Digital's installed base has been a traditional target market for third-party maintenance companies, in part due to DEC's willingness, in fact encouragement, of users to go to OEM and VARS who provided the lowest complete system cost, regardless of peripheral manufacturer. As a result, a high percentage of DEC sites contained "foreign" peripherals, which encouraged TPM penetration into these locations. Exhibit III-I-13 demonstrates that 40% of all DEC users are experienced with TPM. DEC has actively participated in the TPM market by offering limited services to users of DEC systems with non-DEC peripherals.

EXHIBIT III-1-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
DEC



DEC supermini user software ratings are surprisingly low, considering that 60% of DEC users are satisfied with their overall software support.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

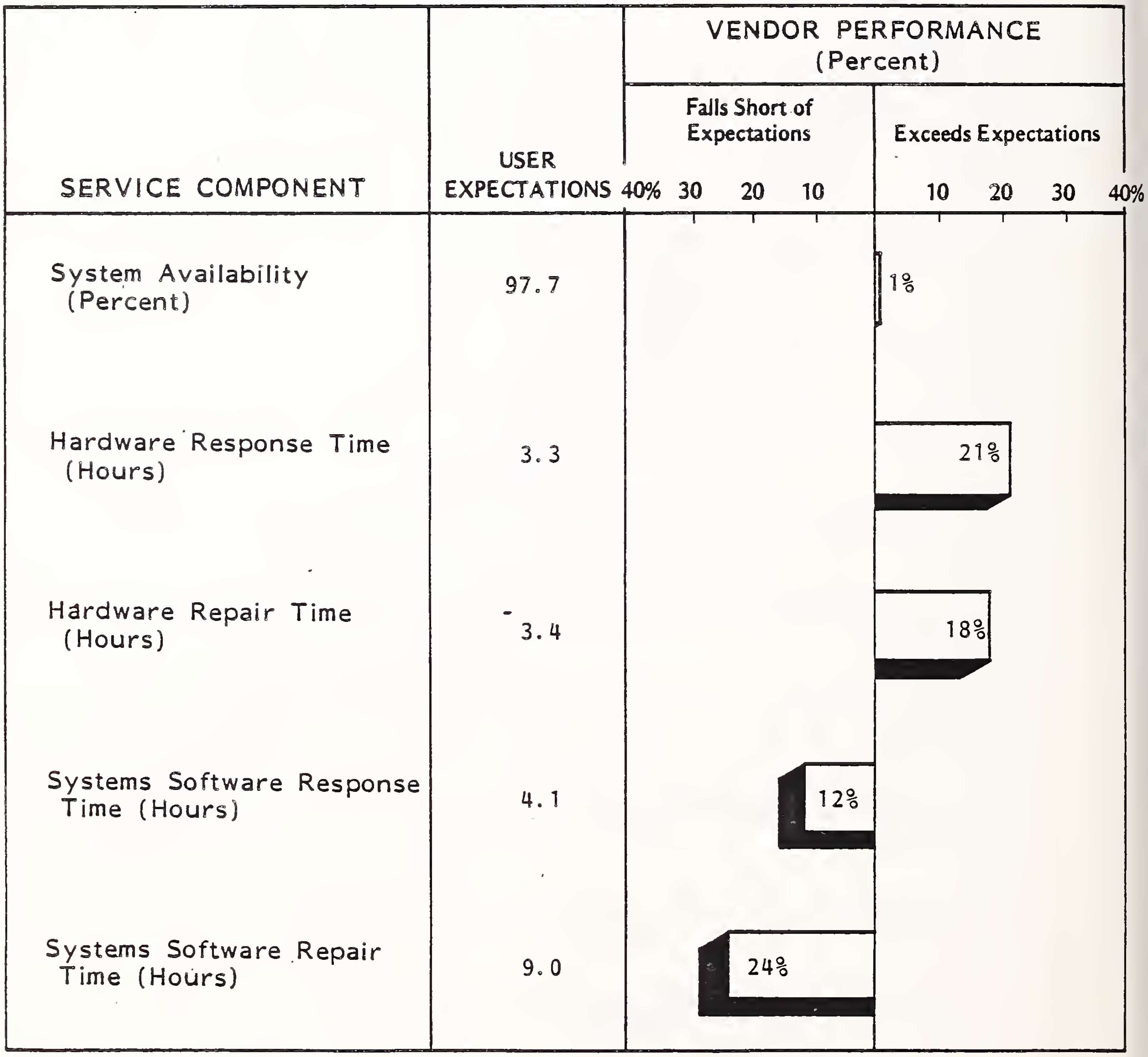
EXHIBIT III-I-9

SERVICE PERFORMANCE
DEC

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	96.6%	98.5%
Average Number of Interruptions		
Per Month (Number)	2.5	1.5
Percent Hardware Caused	70.0%	70.0%
Percent Software Caused	30.0%	25.0%
Average Hardware Response Time (Hours)	2.4 hr.	2.6 hr.
Average Hardware Repair Time (Hours)	3.9 hr.	2.8 hr.
Average Systems Software Response Time (Hours)	9.5 hr.	4.6 hr.
Average Systems Software Repair Time (Hours)	10.9 hr.	11.2 hr.

EXHIBIT III-1-10

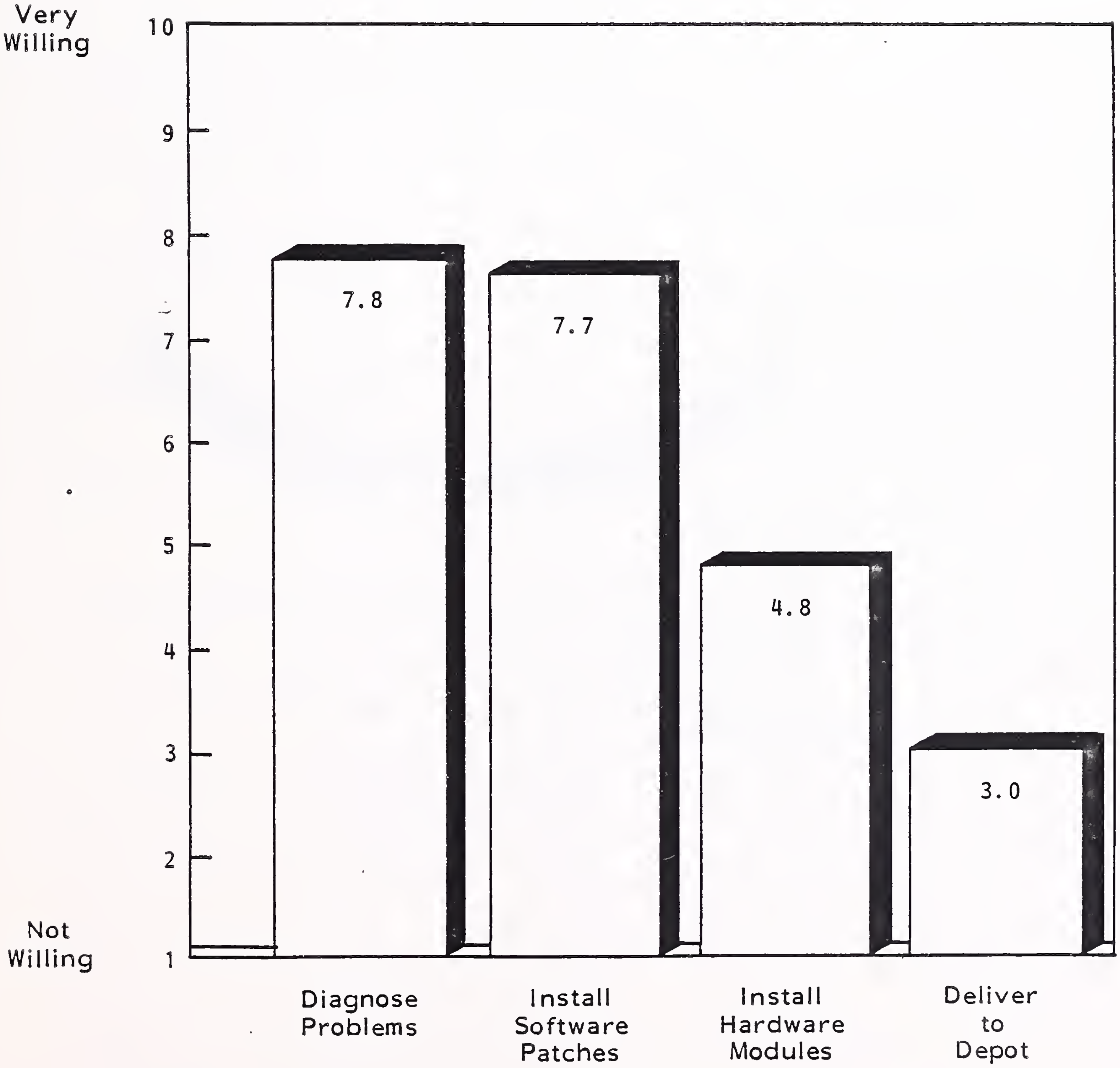
USER EXPECTATIONS FOR SERVICE PERFORMANCE
DEC



SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent): Falls Short of Expectations	VENDOR PERFORMANCE (Percent): Exceeds Expectations
System Availability (Percent)	97.7		1%
Hardware Response Time (Hours)	3.3		21%
Hardware Repair Time (Hours)	3.4		18%
Systems Software Response Time (Hours)	4.1	12%	
Systems Software Repair Time (Hours)	9.0	24%	

EXHIBIT III-I-11

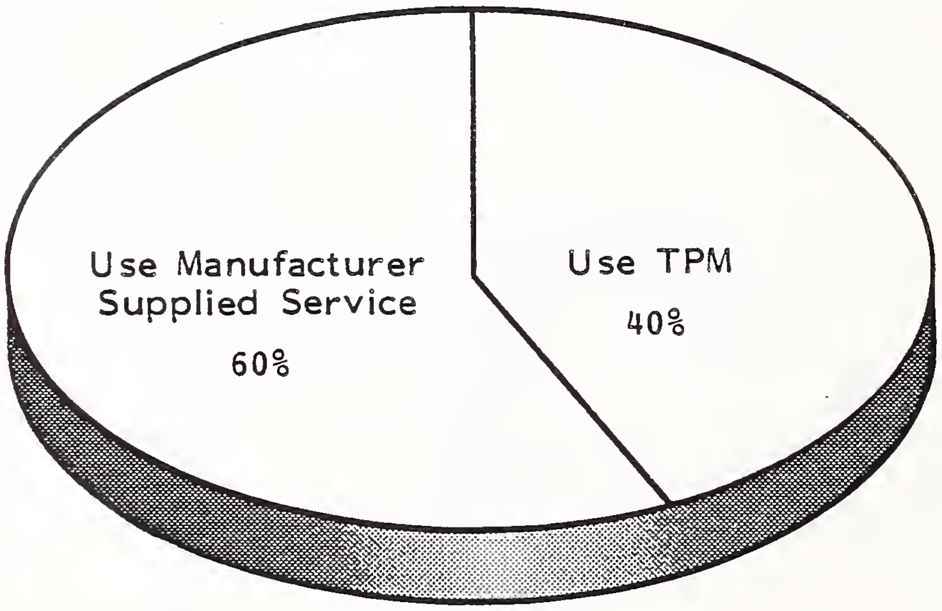
USER WILLINGNESS TO PERFORM MAINTENANCE
DEC



* Average Standard Error: 0.3

EXHIBIT III-I-12

CURRENT TPM USE
DEC

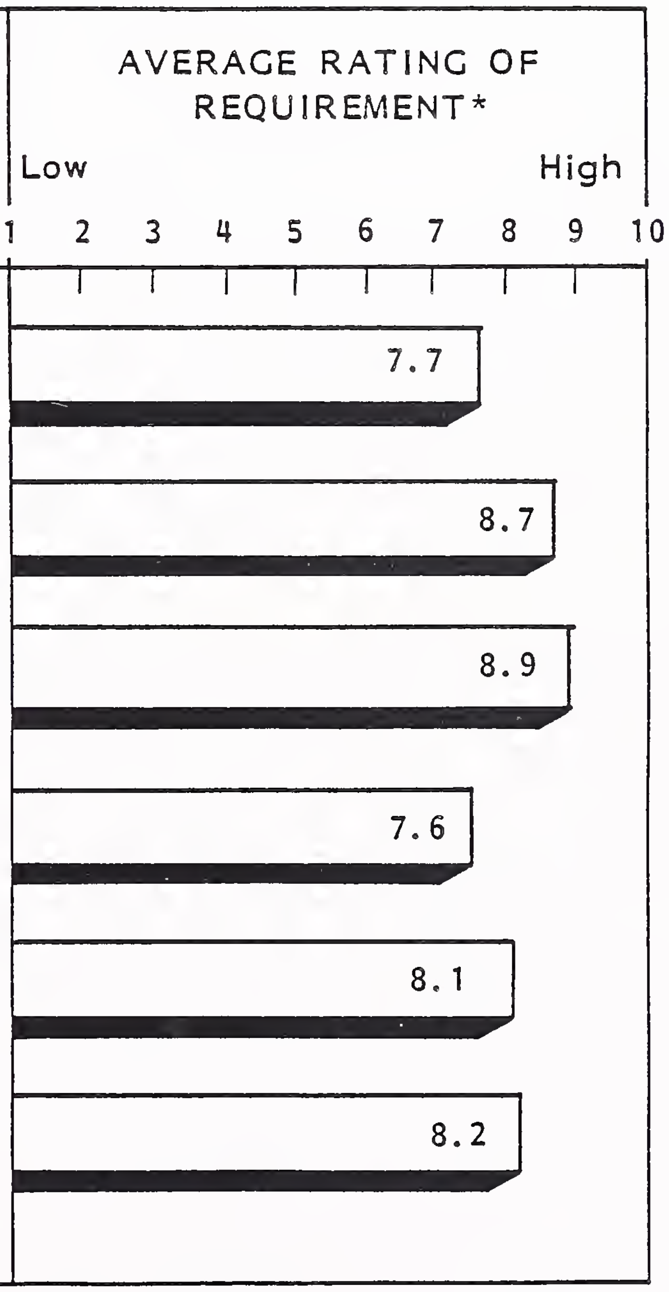


DEC systems have traditionally been a large market for third-party maintenance.

EXHIBIT III-I-13

USER REQUIREMENTS FOR EXTENDED SERVICES
DEC

SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT*
Standby Coverage	40%	7.7
Remote Diagnostics	68	8.7
Preventive Maintenance during Non-Prime Hours	84	8.9
Deferred Response	12	7.6
Under Two-Hour Response	36	8.1
Maintenance Management	52	8.2



*Average Standard Error: 0.7

III J. AT&T

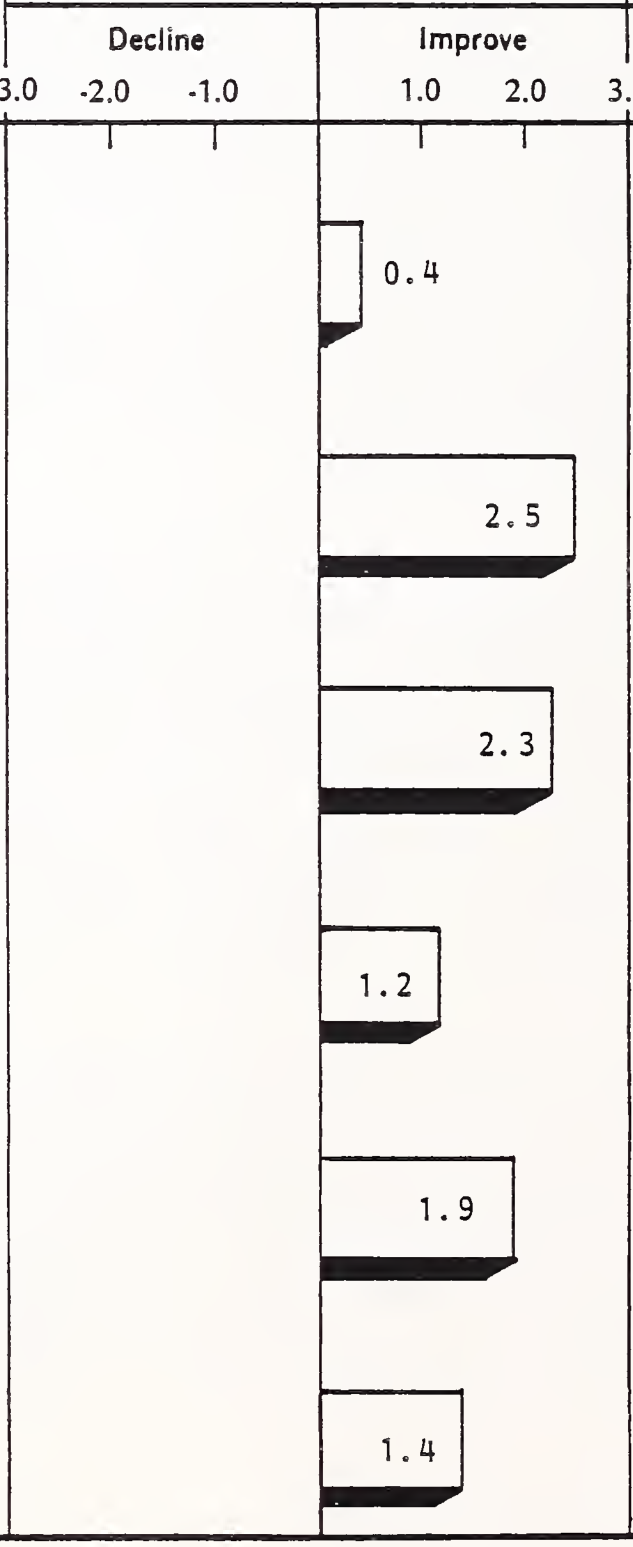
- In May 1986 INPUT interviewed 20 AT&T 3B/XXX superminicomputer users regarding their satisfaction with the hardware service and system software support that they have received from their manufacturer. All interviews were performed by telephone, each approximately 20 minutes in length. INPUT targeted the highest ranking data processing individual available, usually a director or manager of data processing; however, the smaller size of some of the AT&T user organizations required us to interview owners or vice presidents of these companies. Also, two respondents were involved more directly with the financial operations of their companies (as treasurers), perhaps reflecting the application of the AT&T 3Bs at their sites. The industry breakdown of the AT&T sample reflects an emphasis on business services, which made up 35% of the survey sample. Other industries represented by a number of respondents include discrete manufacturing, education, and retail distribution.

- Exhibit III-J-1 indicates that AT&T 3B users have recognized a significant improvement in virtually all hardware maintenance components tested in 1985 and 1986. Of course, 1985 was AT&T's first year in the computer maintenance industry, and, as "freshmen" in the business, demonstrated the uneven performance one would usually associate with a "rookie player." It is promising that users reported improvements in key areas such as parts availability, and in secondary service areas, such as consulting and training.

- However, there is still much room for improvement, as indicated by Exhibit III-J-2. After taking the standard error of the mean into account, AT&T succeeds in meeting their users' service requirement levels in only three of the seven hardware service categories analyzed in 1986. More importantly, only one of these areas of service satisfaction, FE skill level, can be considered a high priority service, at least as perceived by users.

EXHIBIT III-J-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
AT&T



HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING*	
		1985	1986†
Documentation	0.4	5.1	5.5
Training	2.5	3.5	6.0
Consulting	2.3	5.0	7.3
Engineer Skill Level	1.2	6.5	7.7
Parts Availability	1.9	4.8	6.7
Service Overall	1.4	6.1	7.5

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-J-2

1986 USER HARDWARE SERVICE RATINGS
AT&T

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	8.2	5.9	(2.3)
Training	6.3	6.0	(0.3)
Consulting	6.9	7.3	0.4
Remote Support	8.2	6.9	(1.3)
Engineer Skill Level	8.1	7.7	(0.4)
Parts Availability	8.9	6.7	(2.2)
Hardware Service Overall	8.5	7.5	(1.0)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

- Of particular concern should be the low user satisfaction reported in the areas of parts availability, which satisfies only 33% of AT&T 3B users (as shown in Exhibit III-J-3) and of hardware documentation, which satisfies only 12%. The user dissatisfaction with spare parts availability is also reflected in hardware response and repair times (which will be discussed later). The dissatisfaction with hardware documentation can also be more directly costly to AT&T, since a number of user problems that require dispatching are often documentation-related.

- Exhibit III-J-4 graphically demonstrates the gap between AT&T user hardware service requirements versus hardware service received.

- Software support is another area where AT&T has made significant progress, as shown in Exhibit III-J-5. Again, user satisfaction with AT&T's support was extremely low in 1985, so AT&T had a lot of room for improvement. Nevertheless, AT&T demonstrated much progress in all software support categories analyzed, particularly training and consulting.

- Exhibit III-J-6 indicates that, similar to hardware maintenance, AT&T has still a long way to go in meeting the rapidly growing software support requirements that are indicative of superminicomputer users. As was true on the hardware side, software documentation is an extremely critical problem at AT&T, satisfying only 20% of the 1986 AT&T 3B sample, as shown in Exhibit III-J-7. Furthermore, AT&T fails to satisfy 50% of their 3B users in every category analyzed, and only 25% of AT&T's users are satisfied with software support overall. Exhibit III-J-8 further demonstrates the work still ahead for AT&T in the area of software support.

- Exhibit III-J-9 illustrates the improvements that AT&T has made in the reliability of their equipment and the responsiveness of support. System availability improved from 90.9% in 1985 to an admirable 98.7% in 1986. The number of system interruptions improved from 4.4 per month to an acceptable 1.6 per month. Hardware problem resolution turnaround time went from an extremely high 35.7 hours to 13.9 hours in 1986.

EXHIBIT III-J-3

USER SATISFACTION: HARDWARE SERVICE
AT&T

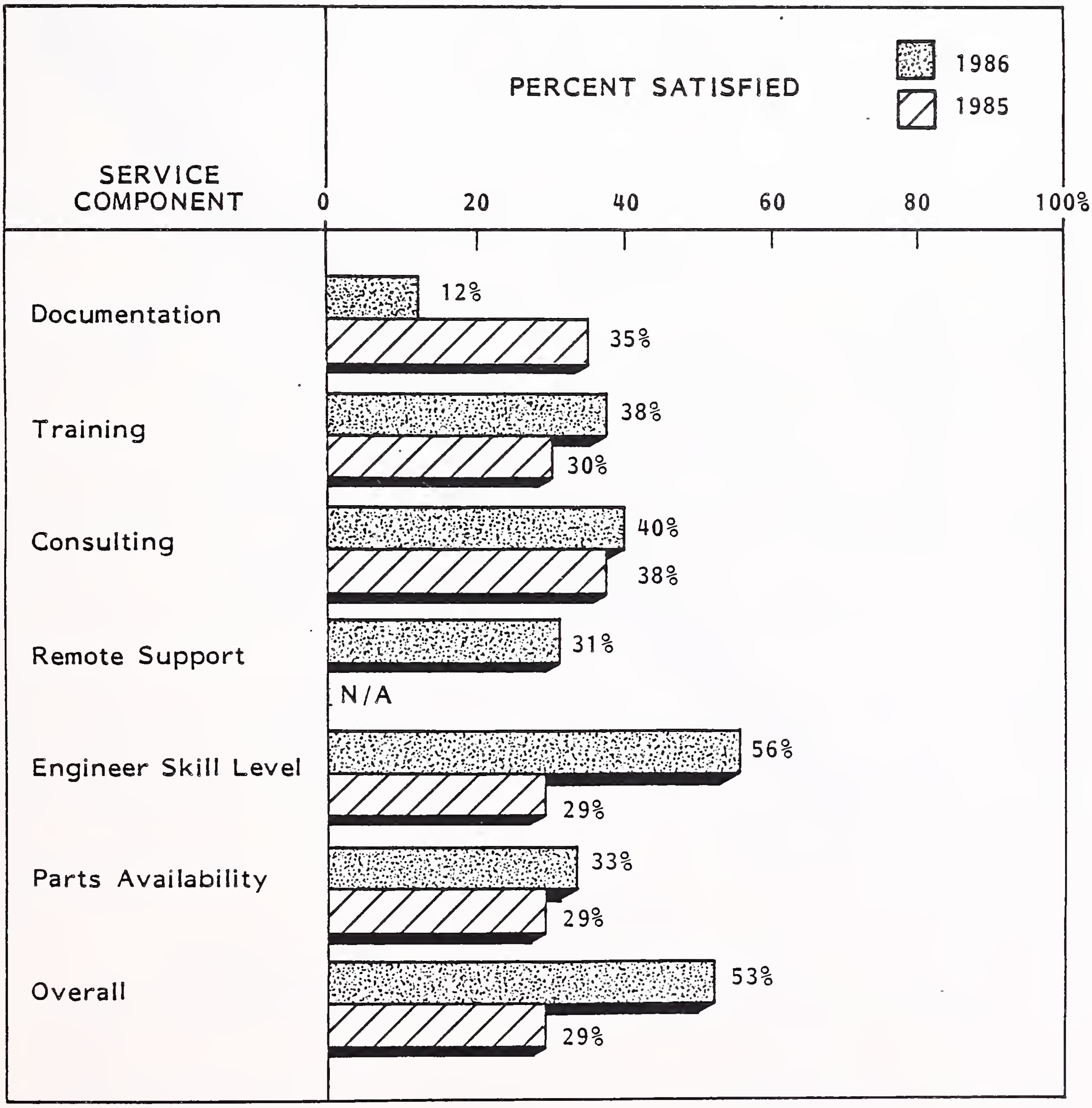
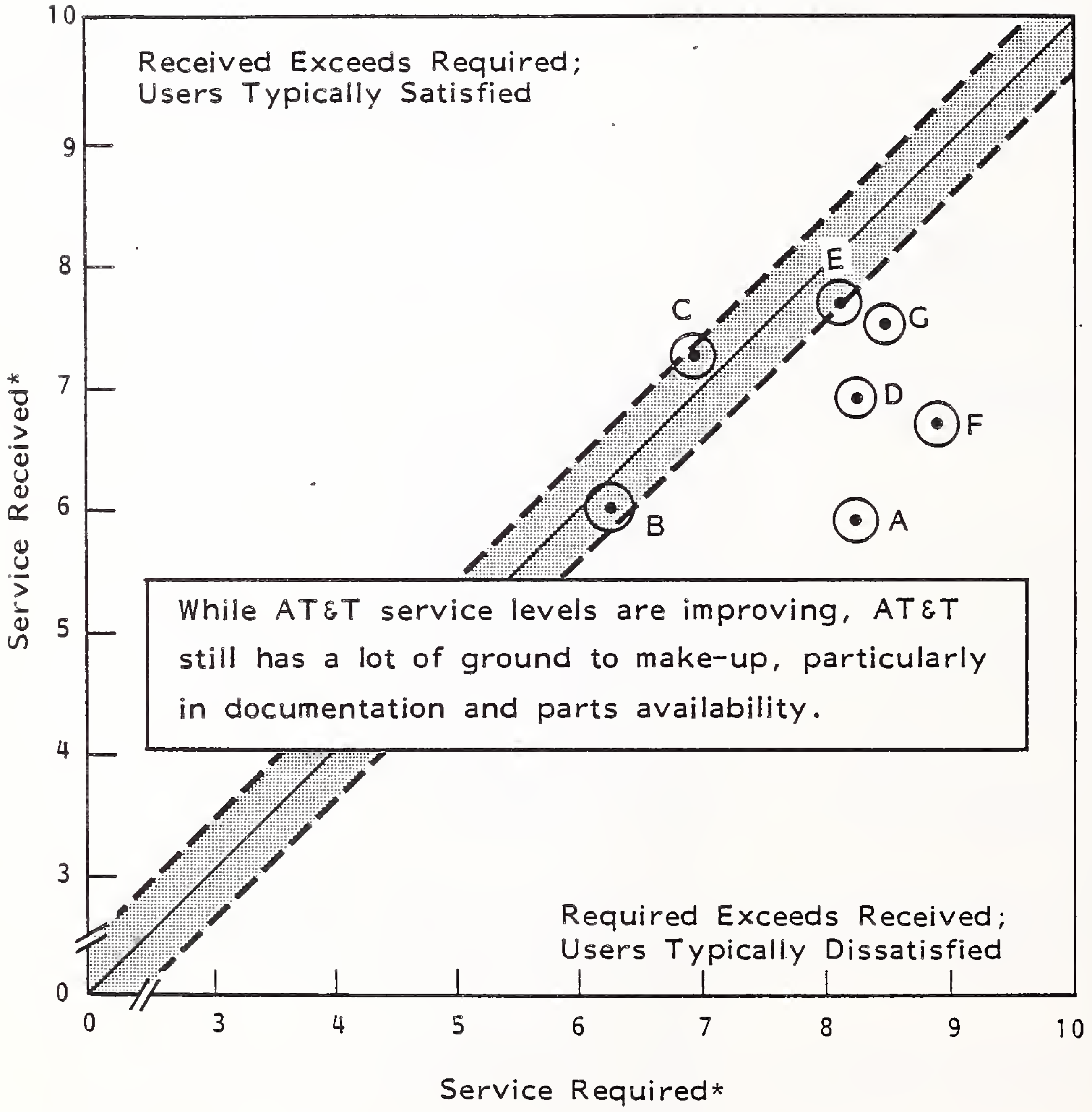


EXHIBIT III-J-4

HARDWARE SERVICES REQUIRED/RECEIVED
AT&T



While AT&T service levels are improving, AT&T still has a lot of ground to make-up, particularly in documentation and parts availability.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

INP
FLSU

EXHIBIT III-J-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
AT&T

SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE		USER RATING*	
	Decline -1.5 -1.0 -0.5	Improve 0.5 1.0 1.5	1985	1986†
Documentation		1.5	5.2	6.7
Training		2.9	3.6	6.5
Consulting		2.2	4.6	6.8
Engineer Skill Level		1.9	5.3	7.2
Service Overall		1.4	5.8	7.2

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-J-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
AT&T

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	9.2	6.7	(2.5)
Training	7.4	6.5	(0.9)
Consulting	7.5	6.8	(0.7)
Remote Support	7.9	6.7	(1.2)
Engineer Skill Level	8.7	7.2	(1.5)
Service Overall	8.8	7.2	(1.6)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-J-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICE
AT&T

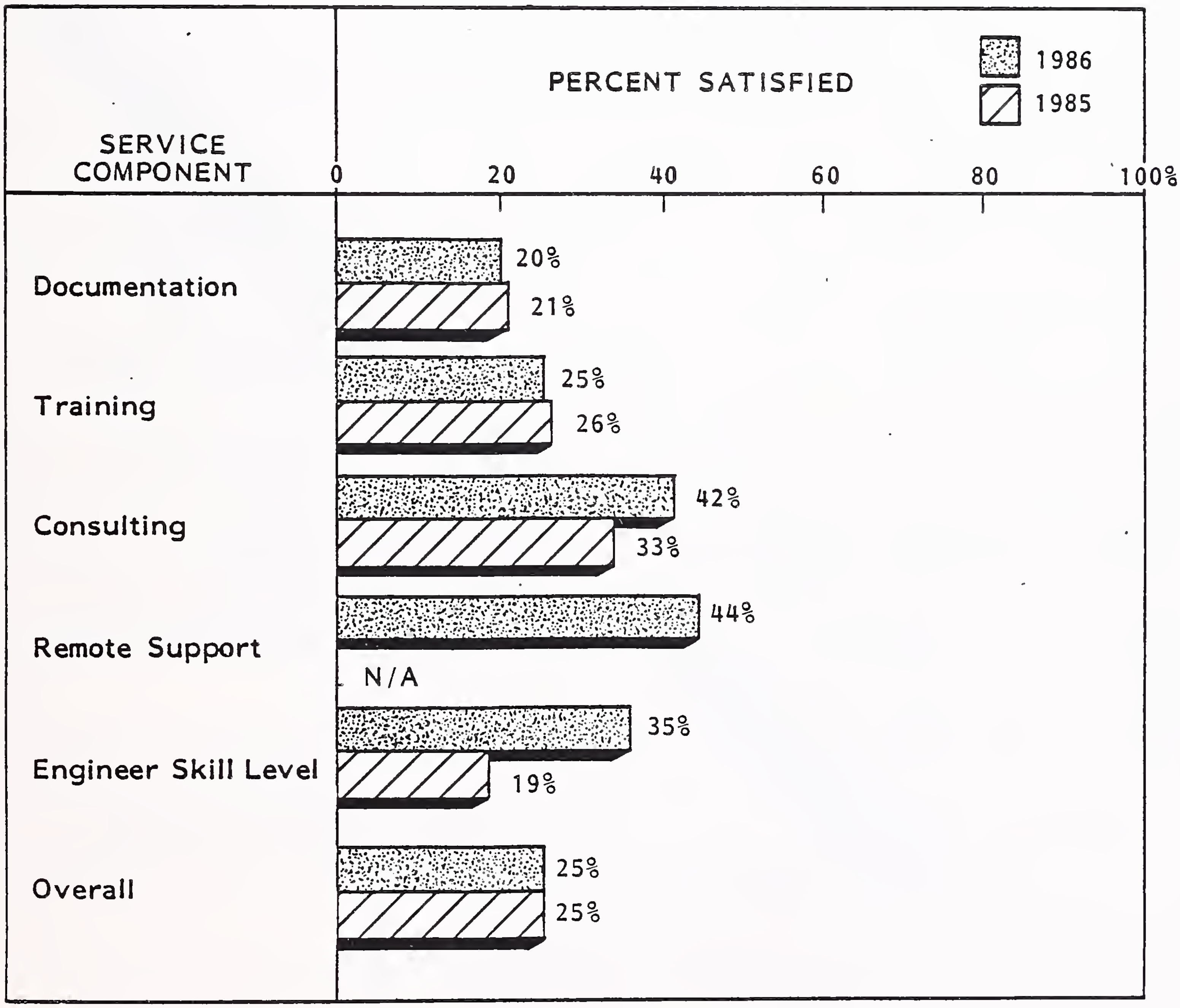
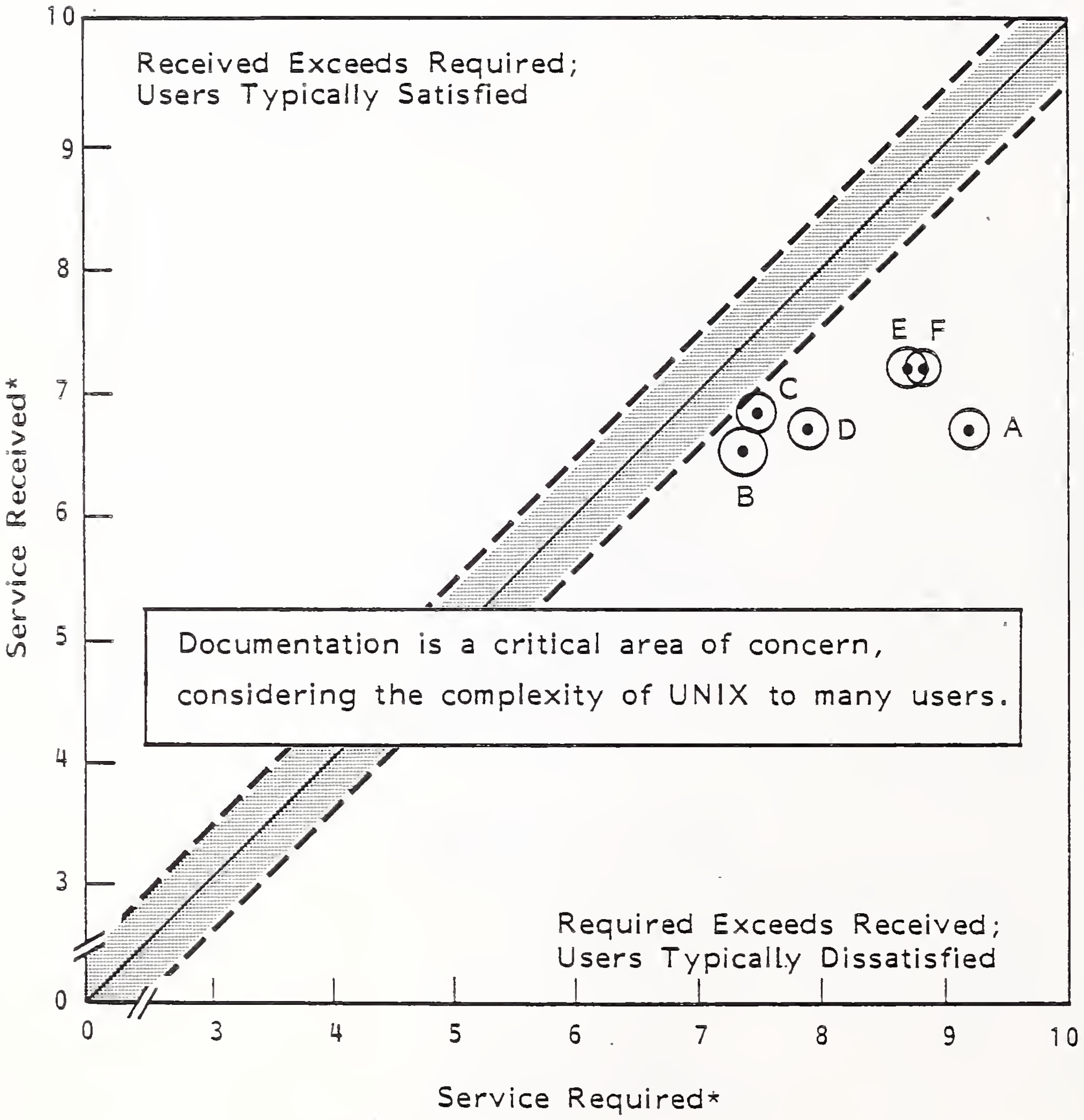


EXHIBIT III-J-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
AT&T



A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-J-9

SERVICE PERFORMANCE
AT&T

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	90.9%	98.7%
Average Number of Interruptions		
Per Month (Number)	4.4	1.6
Percent Hardware Caused	35.0%	52.0%
Percent Software Caused	59.0%	38.0%
Average Hardware Response Time (Hours)	13.4 hr.	6.3 hr.
Average Hardware Repair Time (Hours)	22.3 hr.	7.6 hr.
Average Systems Software Response Time (Hours)	12.5 hr.	13.4 hr.
Average Systems Software Repair Time (Hours)	16.3 hr.	9.4 hr.

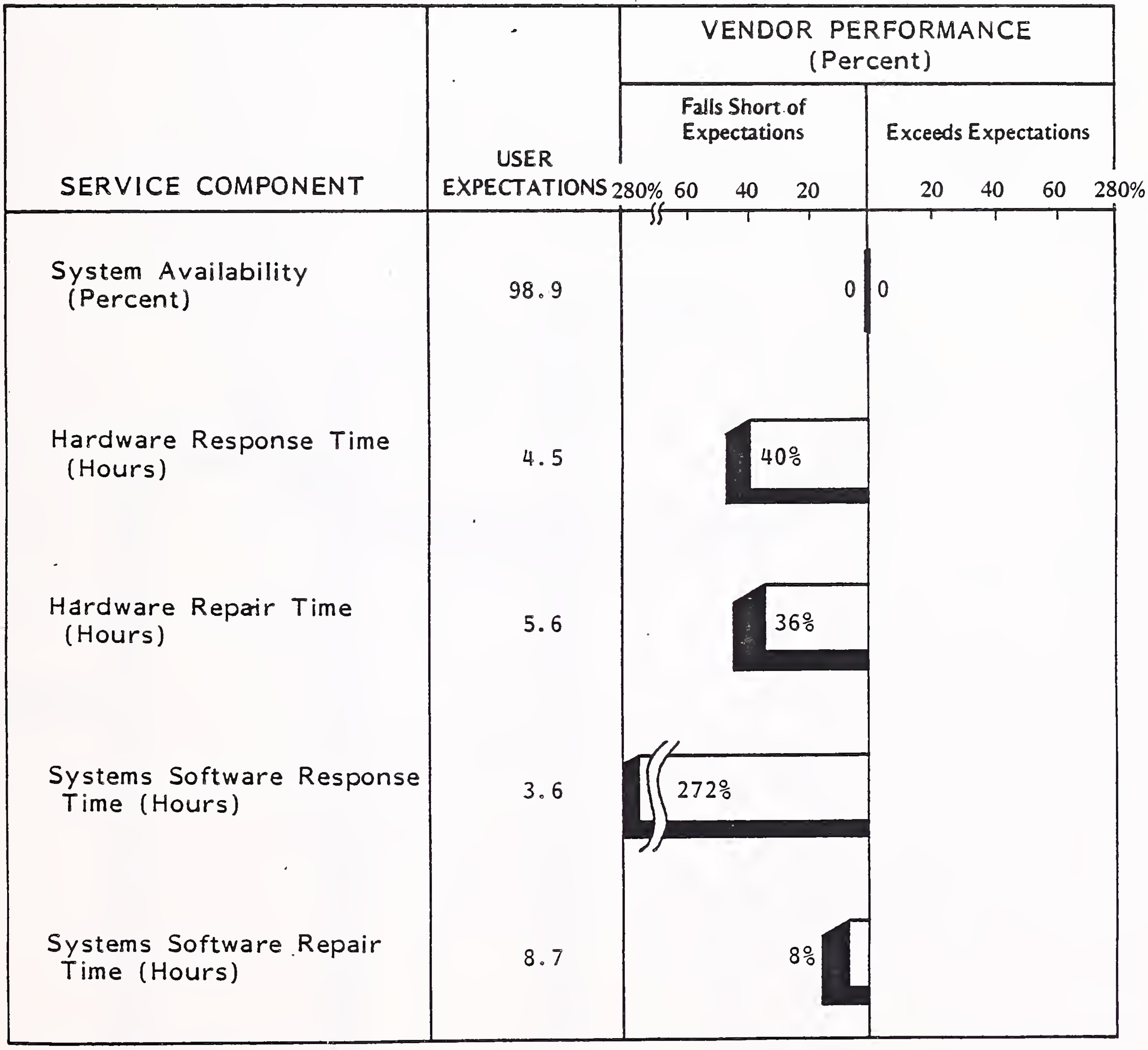
- While AT&T has managed to satisfy their 3B users' requirement for system availability, Exhibit III-J-10 indicates that problem resolution turnaround time continues to be of major concern to their users. Users are requiring that hardware problems be resolved within a single day, not by the next day. Also, AT&T's users clearly have perceived a problem in regard to system software support. More accessible spares and improved documentation will help alleviate both of these problem areas.

- Users are initially attracted to AT&T because of the allure of stability and support that AT&T carries with them from the telecommunications side. This is reflected by the users' limited willingness to assume increased responsibility for hardware maintenance or software support, as shown in Exhibit III-J-11. What AT&T should be concerned about is an increase in users who defect to third-party maintenance, since one-fourth of the AT&T user sample are already experienced with TPM, as shown in Exhibit III-J-12.

- Exhibit III-J-13 indicates that AT&T users do not show significant requirement for premium services, even though current service satisfaction is low. Non-prime hour preventive maintenance visits did appear attractive to 70% of the users.

EXHIBIT III-J-10

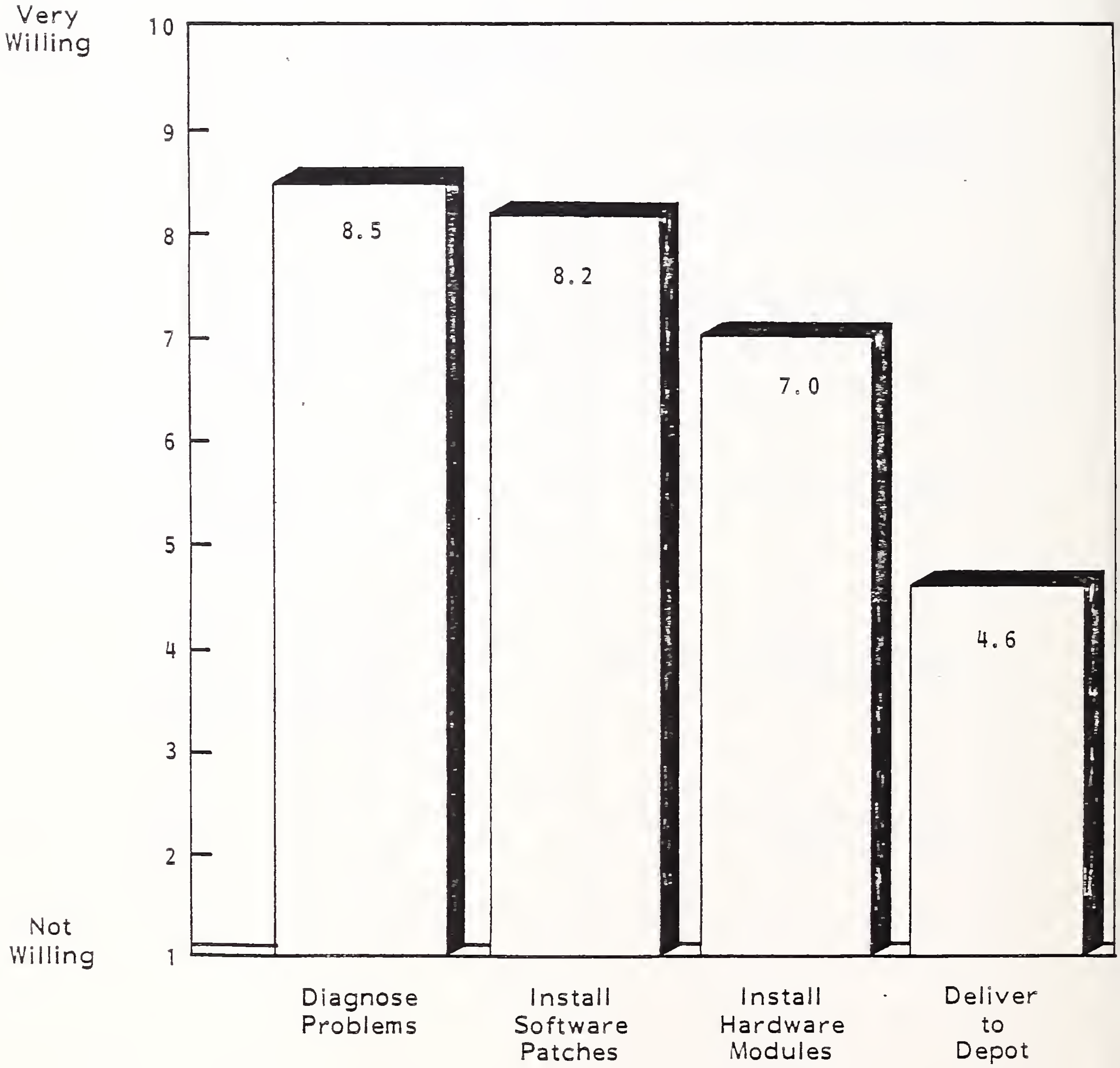
USER EXPECTATIONS FOR SERVICE PERFORMANCE
AT&T



SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent) Falls Short of Expectations	VENDOR PERFORMANCE (Percent) Exceeds Expectations
System Availability (Percent)	98.9	0	0
Hardware Response Time (Hours)	4.5	40%	
Hardware Repair Time (Hours)	5.6	36%	
Systems Software Response Time (Hours)	3.6	272%	
Systems Software Repair Time (Hours)	8.7	8%	

EXHIBIT III-J-11

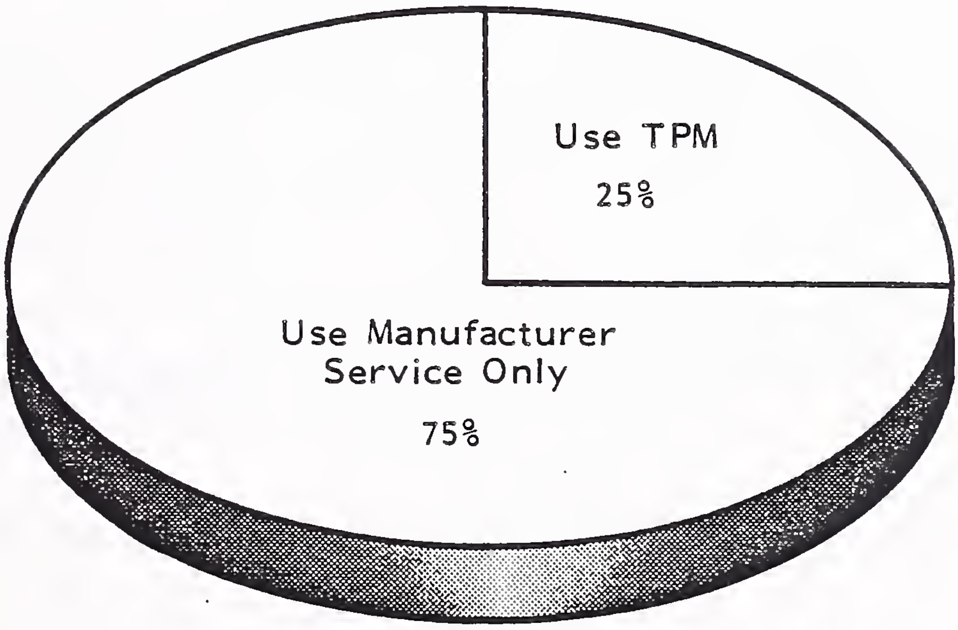
USER WILLINGNESS TO PERFORM MAINTENANCE
AT&T



* Average Standard Error: 0.5

EXHIBIT III-J-12

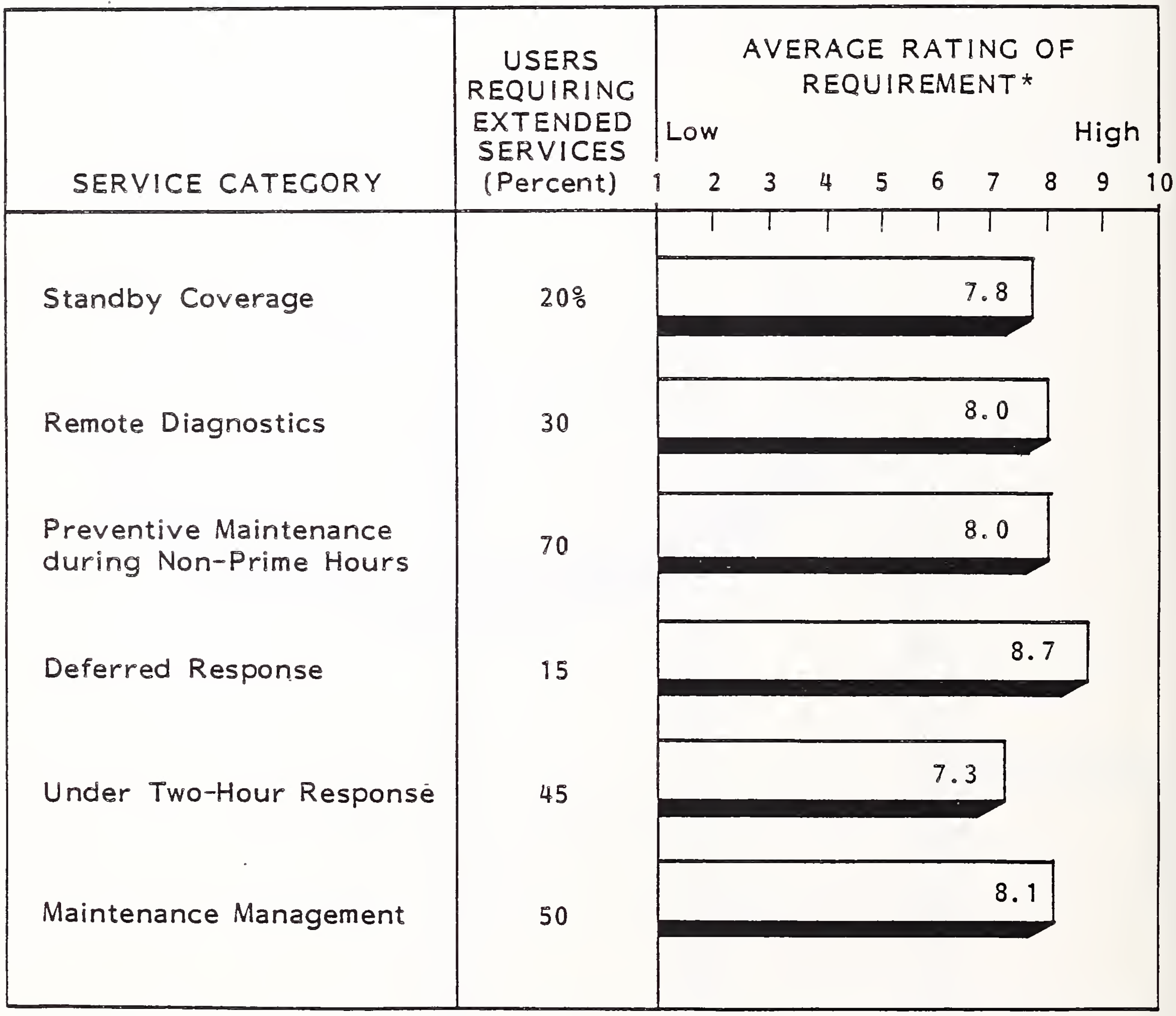
CURRENT TPM USE
AT&T



One-fourth of the AT&T sample have experience with TPM. This will grow quickly if AT&T fails to improve service quality.

EXHIBIT III-J-13

USER REQUIREMENTS FOR EXTENDED SERVICES
AT&T



SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT* (Low 1 – 10 High)
Standby Coverage	20%	7.8
Remote Diagnostics	30	8.0
Preventive Maintenance during Non-Prime Hours	70	8.0
Deferred Response	15	8.7
Under Two-Hour Response	45	7.3
Maintenance Management	50	8.1

*Average Standard Error: 0.3

III K. NCR

- In March 1986 INPUT interviewed 25 NCR 93XX superminicomputer users concerning their satisfaction with the level of hardware maintenance and systems software support that they received from their manufacturer. All interviews were performed by telephone and each interview lasted approximately 20 minutes. The NCR 93XX sample was relatively dispersed by industry with 10 of the 13 industry categories represented in the sample. Process manufacturers and educational users each accounted for 16% of the sample; discrete manufacturers, medical, services, and banking users accounting for an additional 12% each of the sample. As always, INPUT targeted directors and managers of data processing as respondents, although four respondents were controllers.

- Exhibit III-K-1 indicates that while NCR superminicomputer users perceived a drop in hardware documentation from 1985 to 1986, these users reported an improvement in key service areas, such as FE skill level and spare parts availability. More over, Exhibit III-K-2 demonstrates that NCR has successfully met or exceeded their superminicomputer user service requirements in virtually all of the hardware service categories analyzed in 1986 (with the exception of hardware documentation). Exhibit III-K-3 supports these findings, with NCR satisfying a high percentage of their users' needs in nearly all areas. Note that the high marks in service satisfaction even carry over into hardware documentation, where NCR still satisfies a majority (64%) of their superminicomputer users. Also note the cumulative effect on overall service satisfaction, where 8 out of 10 NCR 9300 users report satisfactory service. Exhibit III-K-4 graphically demonstrates NCR's success at meeting their superminicomputer user service requirements, particularly in high-requirement service areas.

- NCR's efforts to satisfy their superminicomputer users' software support needs are less successful. Exhibit III-K-5 indicates that NCR's "received"

EXHIBIT III-K-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
NCR

HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE (Decline -1.5 -1.0 -0.5 / Improve 0.5 1.0 1.5)	USER RATING* 1985	USER RATING* 1986†
Documentation	-1.1	7.6	6.5
Training	-0.8	7.2	6.4
Consulting	0	7.5	7.5
Engineer Skill Level	0.4	8.5	8.9
Parts Availability	0.4	7.7	8.1
Service Overall	0.1	8.5	8.6

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-K-2

1986 USER HARDWARE SERVICE RATINGS
NCR

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	7.1	6.5	(0.6)
Training	6.4	6.4	—
Consulting	7.3	7.5	0.2
Remote Support	6.7	7.5	0.8
Engineer Skill Level	8.6	8.9	0.3
Parts Availability	8.3	8.1	(0.2)
Hardware Service Overall	8.5	8.6	0.1

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-K-3

USER SATISFACTION: HARDWARE SERVICE
NCR

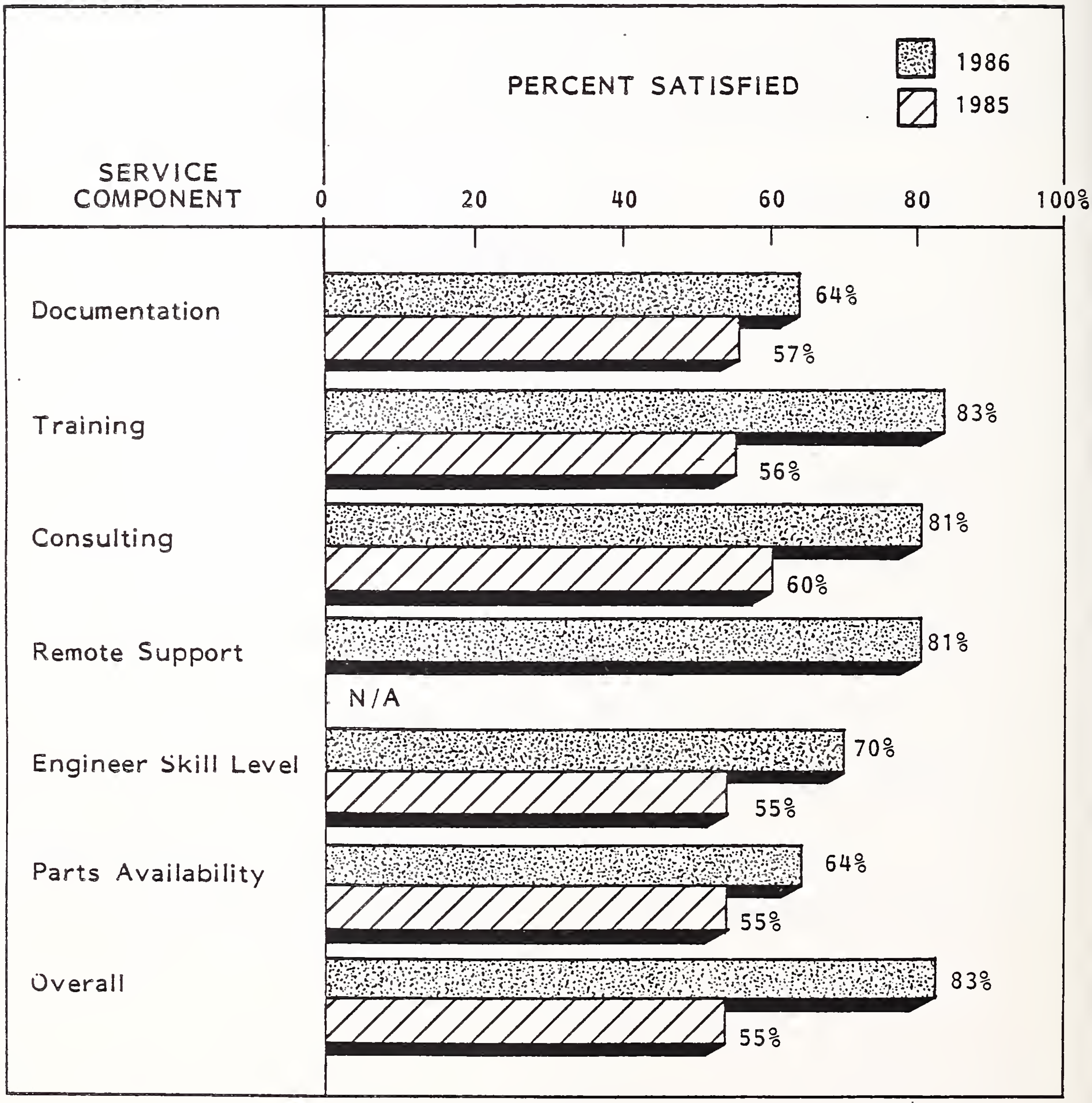
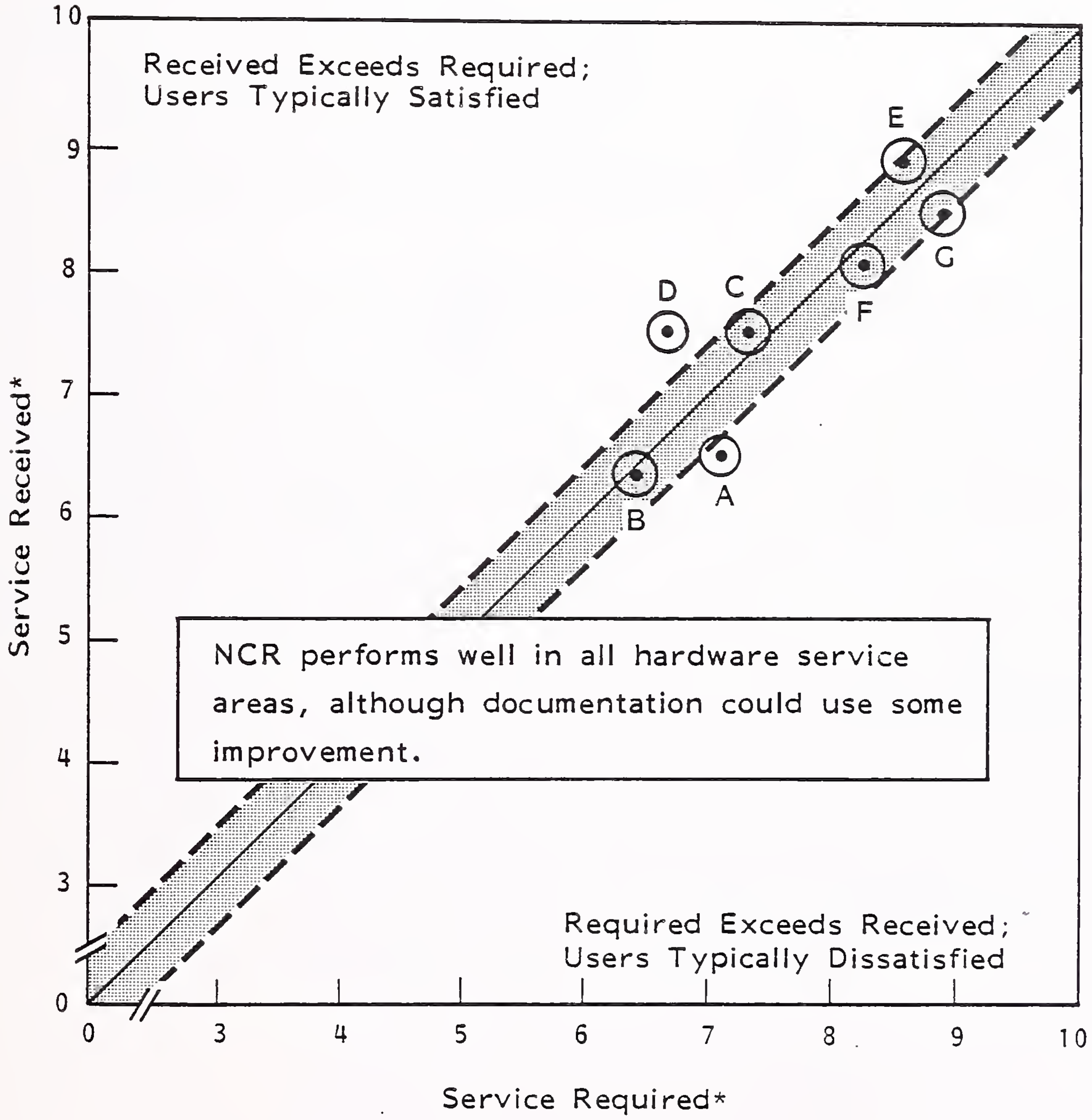


EXHIBIT III-K-4

HARDWARE SERVICES REQUIRED/RECEIVED
NCR



A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-K-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
NCR

SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE (Decline -1.5 to Improve 1.5)	USER RATING* 1985	USER RATING* 1986†
Documentation	-0.2	7.2	7.0
Training	0.4	6.6	7.0
Consulting	0.2	7.1	7.3
Engineer Skill Level	0.6	7.4	8.0
Service Overall	0.5	7.3	7.8

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.3

ratings improved slightly in all categories except for documentation. However, Exhibit III-K-6 shows that NCR still does not meet the average "requirement" level in any single service area. While NCR manages to satisfy a large percentage of their users in a few key service areas, such as software engineer skill level (71%), user satisfaction with software training is quite low (only 43% satisfied), as shown in Exhibit III-K-7. Training has a significant effect on overall satisfaction, since NCR superminicomputer users place a higher requirement on training than those of their competitors.

- Still, user satisfaction with NCR system software support is surprisingly high, considering the fact that NCR does not meet any single requirement level for their users, as shown graphically in Exhibit III-K-8.

- NCR service performance benefits from the relatively low service requirements of their superminicomputer users. As shown in Exhibit III-K-9, NCR 9300 users have extremely low system availability requirements (94% versus approximately 97% for their competitors), and extremely slow response and repair time requirements. As a result, NCR satisfies their users' needs in these areas, as indicated in Exhibit III-K-10, while increasing overall satisfaction with both hardware service and software support. Furthermore, NCR superminicomputer service satisfaction is high enough to limit both user requirement for alternative service delivery methods, as shown in Exhibit III-K-11, and third-party penetration into their installed base, as shown in Exhibit III-K-12. User satisfaction with NCR superminicomputer service is also reflected in the relatively large number of NCR users, shown in Exhibit III-K-13, who are attracted to the maintenance management concept, where NCR would act as a single source of service and support.

EXHIBIT III-K-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS

NCR

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	8.3	7.0	(1.3)
Training	8.1	7.0	(1.1)
Consulting	7.9	7.3	(0.6)
Remote Support	7.7	7.6	(0.1)
Engineer Skill Level	8.6	8.0	(0.6)
Service Overall	8.5	7.8	(0.7)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-K-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICE
NCR

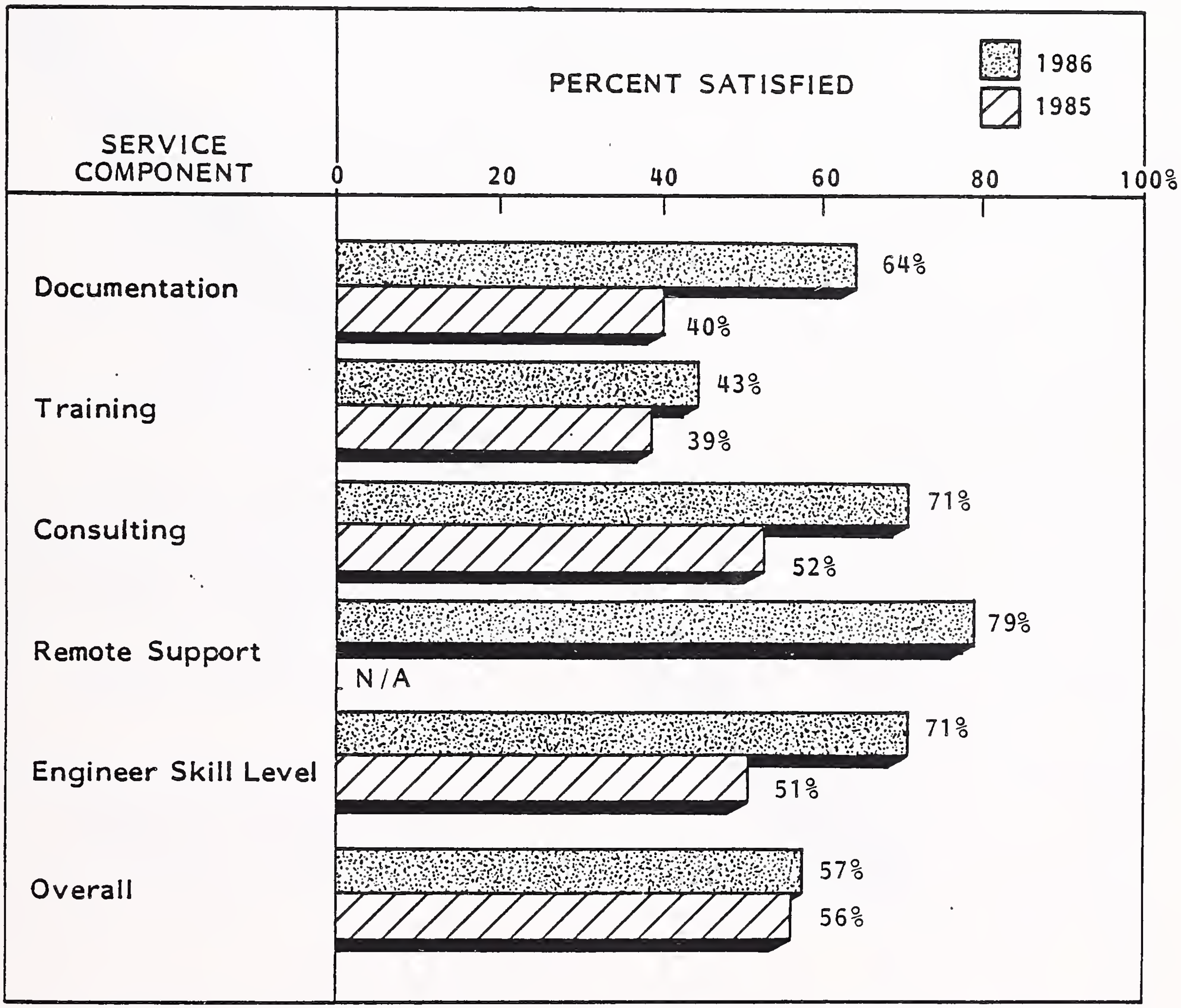
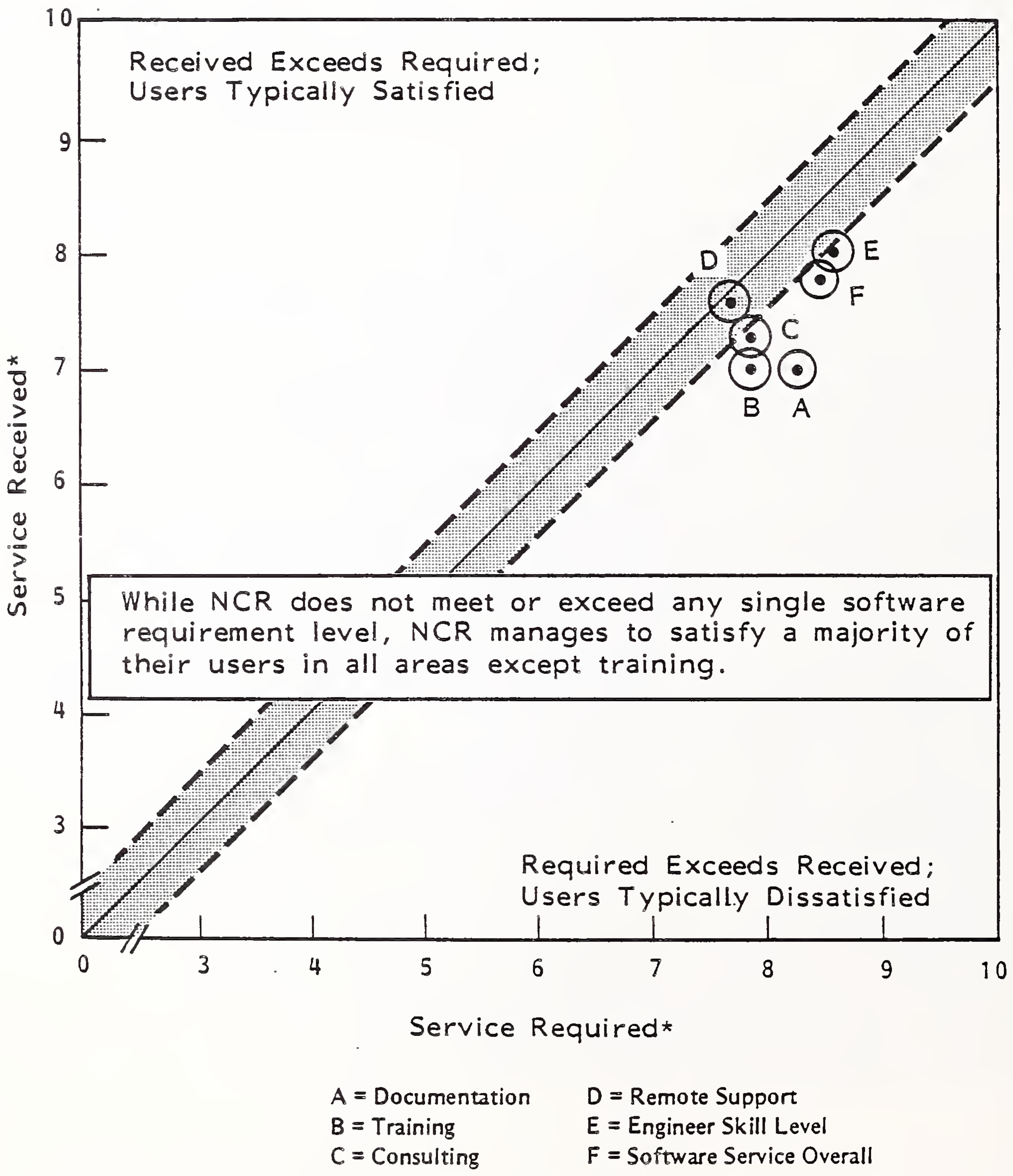


EXHIBIT III-K-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
NCR



While NCR does not meet or exceed any single software requirement level, NCR manages to satisfy a majority of their users in all areas except training.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

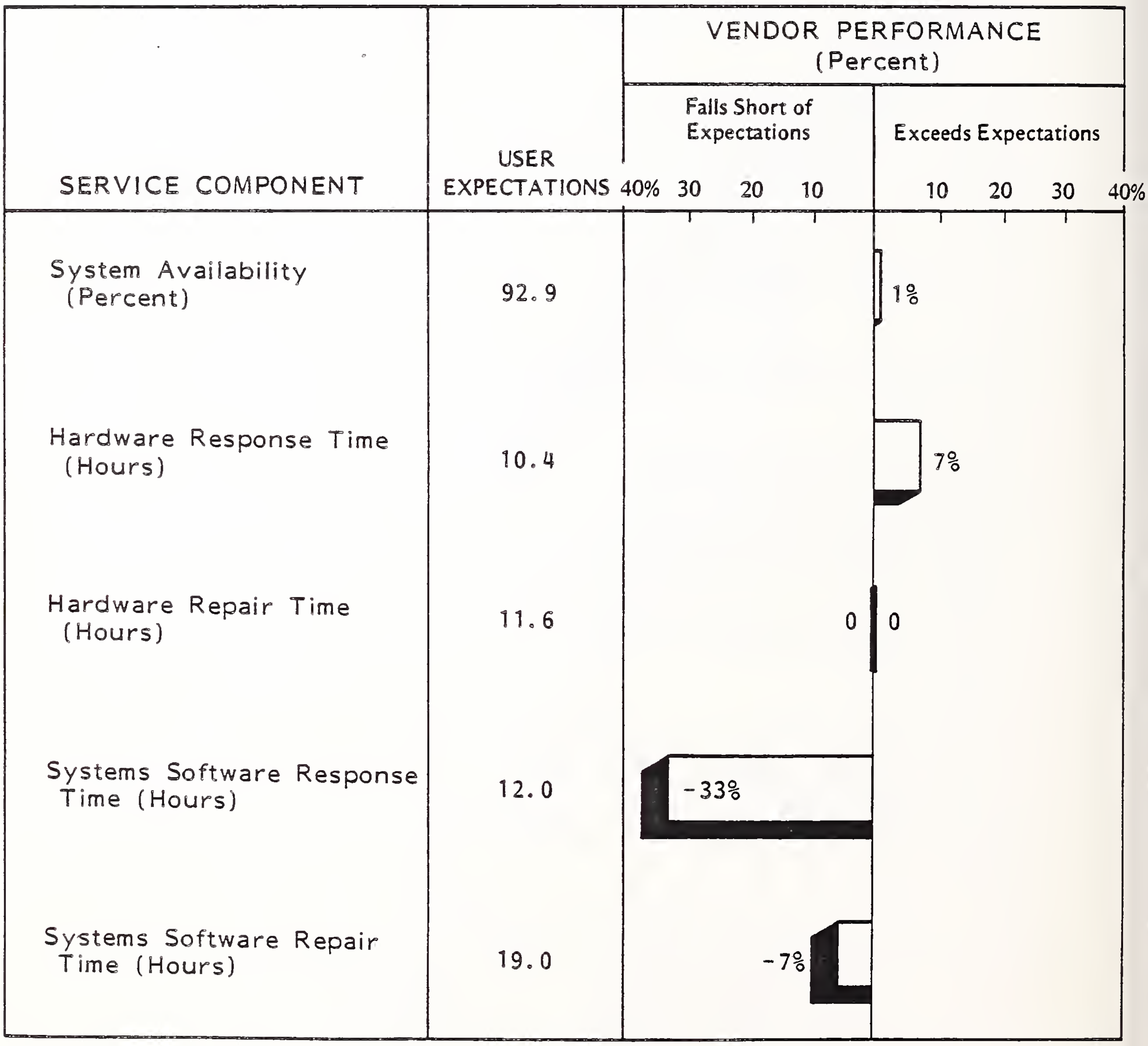
EXHIBIT III-K-9

SERVICE PERFORMANCE
NCR

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	93.5%	93.8%
Average Number of Interruptions		
Per Month (Number)	2.8	1.9
Percent Hardware Caused	50.0%	52.0%
Percent Software Caused	50.0%	27.0%
Average Hardware Response Time (Hours)	5.2 hr.	9.7 hr.
Average Hardware Repair Time (Hours)	2.8 hr.	11.6 hr.
Average Systems Software Response Time (Hours)	7.2 hr.	16.0 hr.
Average Systems Software Repair Time (Hours)	7.5 hr.	21.2 hr.

EXHIBIT III-K-10

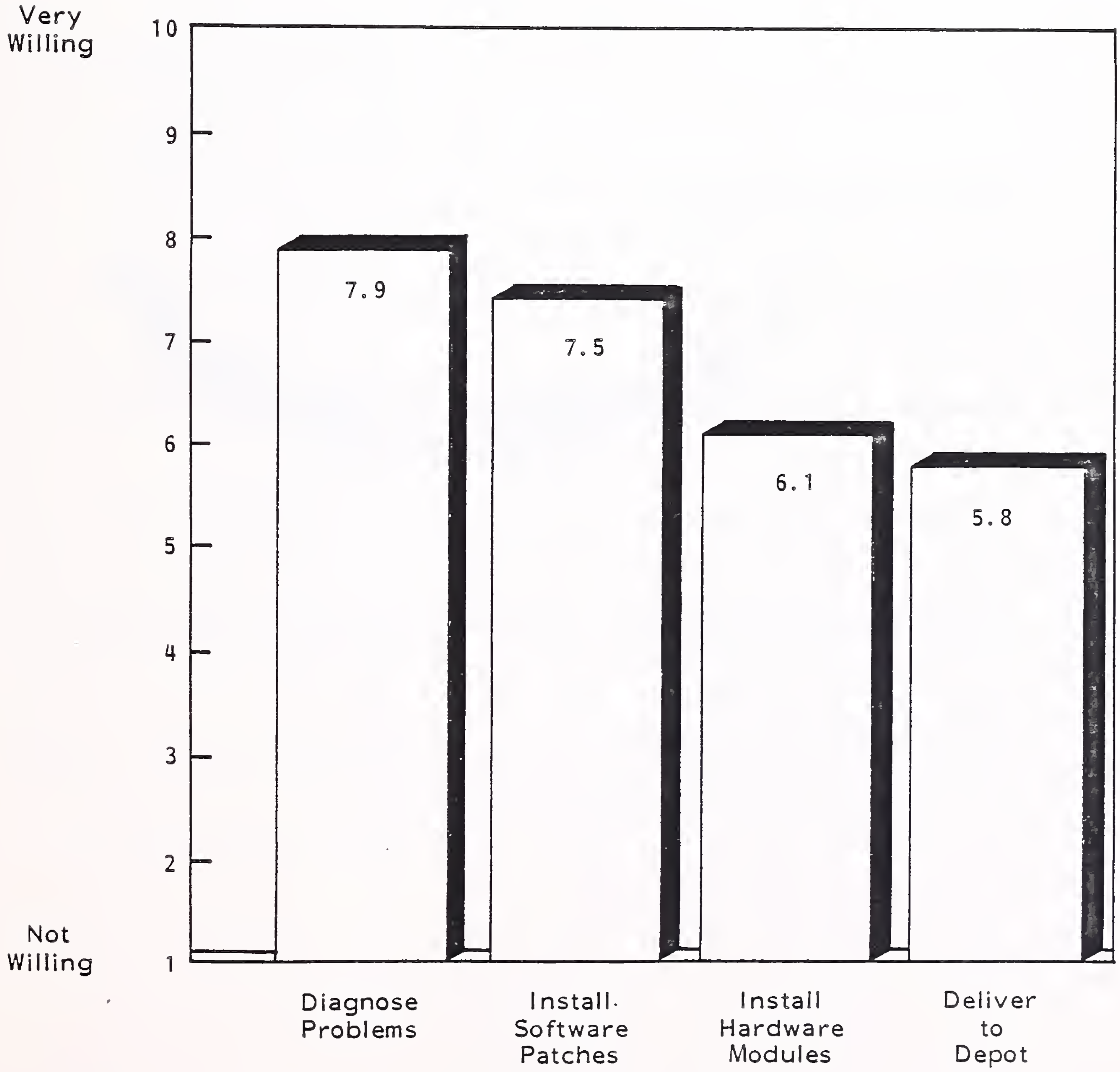
USER EXPECTATIONS FOR SERVICE PERFORMANCE
NCR



SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent)
System Availability (Percent)	92.9	1%
Hardware Response Time (Hours)	10.4	7%
Hardware Repair Time (Hours)	11.6	0
Systems Software Response Time (Hours)	12.0	-33%
Systems Software Repair Time (Hours)	19.0	-7%

EXHIBIT III-K-11

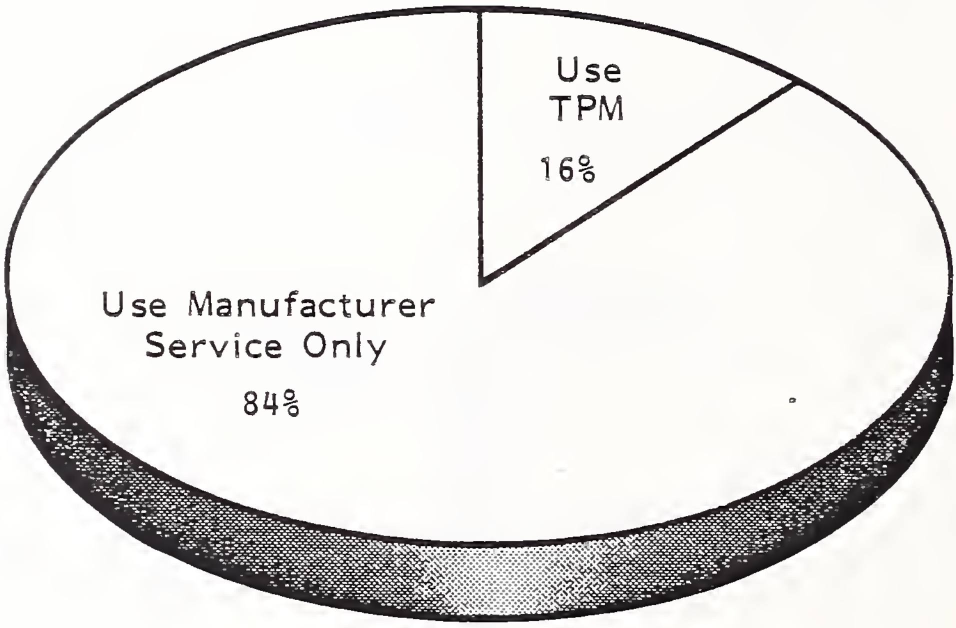
USER WILLINGNESS TO PERFORM MAINTENANCE
NCR



* Average Standard Error: 0.3

EXHIBIT III-K-12

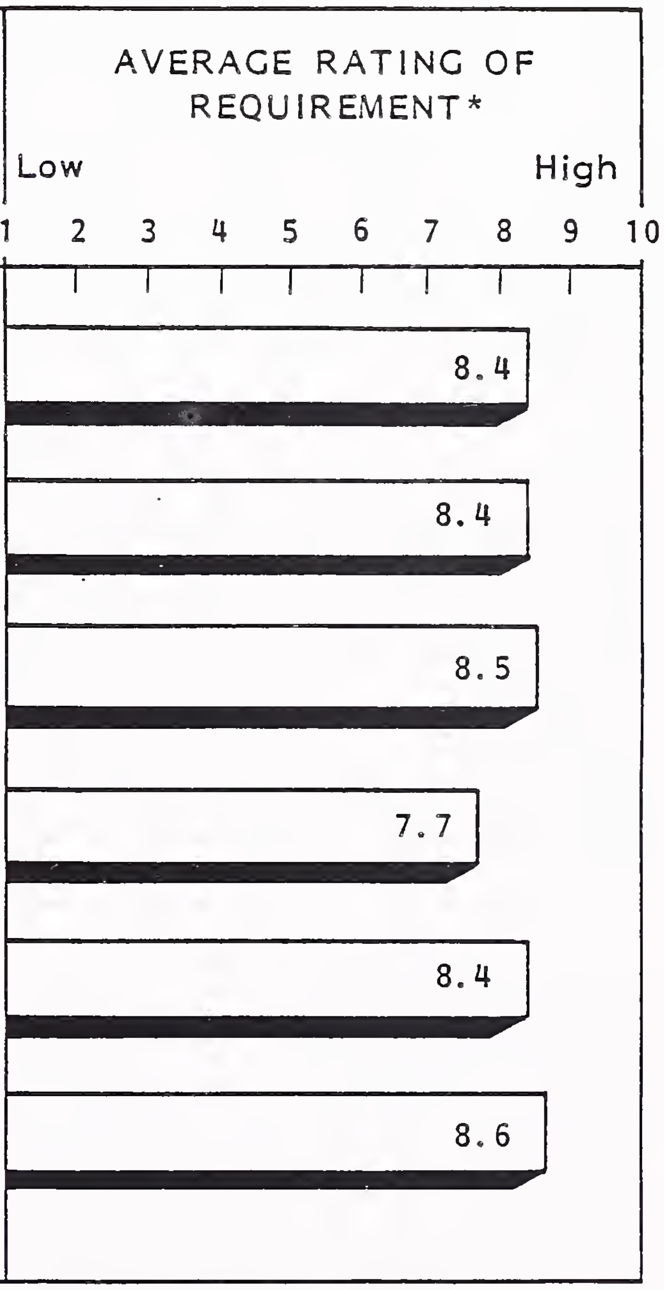
CURRENT TPM USE
NCR



NCR service satisfaction has slowed TPM penetration, however NCR's vertical markets are attractive to TPM.

EXHIBIT III-K-13

USER REQUIREMENTS FOR EXTENDED SERVICES
NCR



SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT*
Standby Coverage	56%	8.4
Remote Diagnostics	64	8.4
Preventive Maintenance during Non-Prime Hours	64	8.5
Deferred Response	44	7.7
Under Two-Hour Response	60	8.4
Maintenance Management	68	8.6

*Average Standard Error: 0.3

III L. PRIME

- In March 1986 INPUT interviewed 25 Prime 2X5X superminicomputer users concerning their satisfaction with the level of hardware maintenance and systems software support they received. All interviews were performed by telephone and each interview lasted approximately 20 minutes. The 1986 Prime sample was dominated by educational users, who comprised 32% of the Prime sample, and business service users who made up another 25%. Other industries represented include discrete manufacturing, wholesale distribution, federal government, process manufacturing, medical, and utilities.

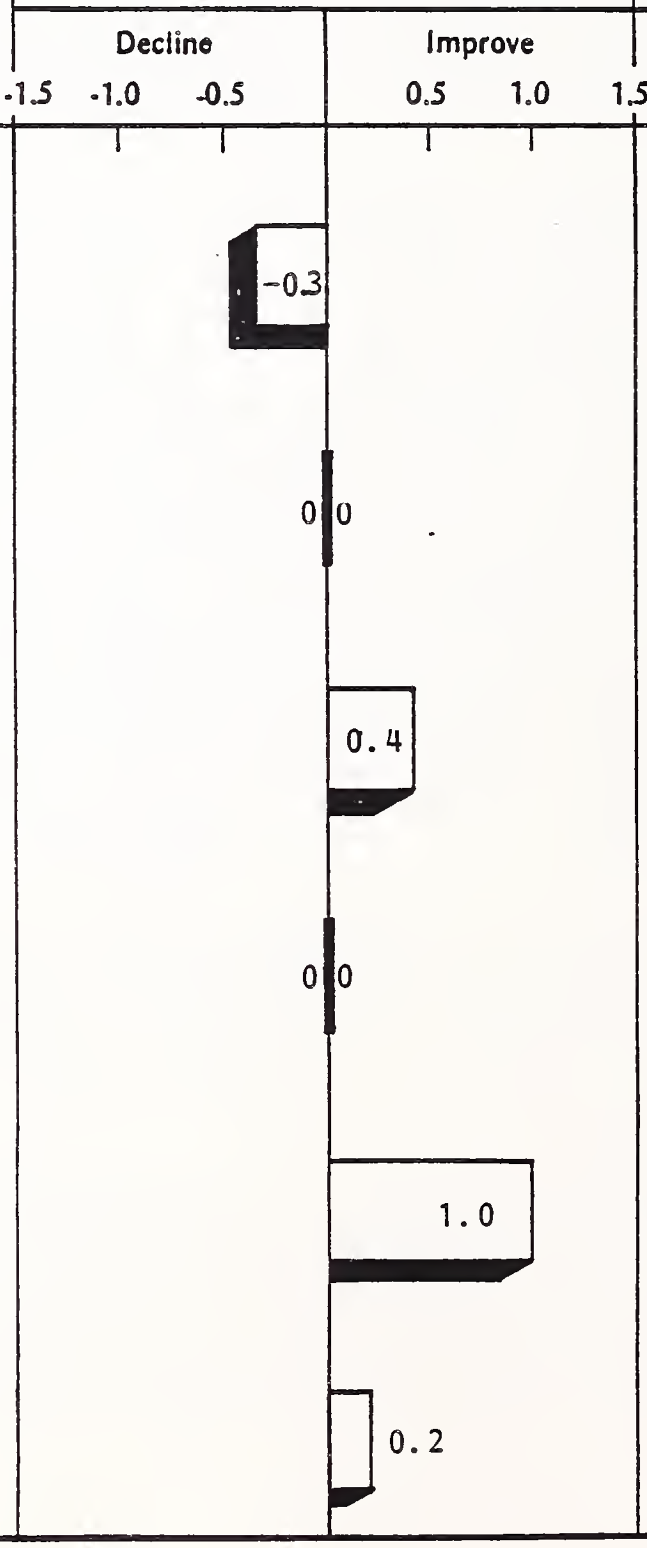
- According to Exhibit III-L-1, Prime superminicomputer user 1986 ratings for hardware service "received" did not vary much from 1985 marks. What is increasingly evident concerning Prime's superminicomputer user base is an extreme segmentation of user requirements between low priority hardware services and high priority service areas. Exhibit III-L-2 demonstrates that Prime meets or even exceeds their users' requirements for a number of low priority services, such as training, consulting, and especially remote support, but fails to meet the requirement levels of the high priority service areas of FE skill level, spare parts availability, and overall satisfaction with hardware service. Furthermore, Prime fails to satisfy a majority of their superminicomputer user needs in a large number of service areas.

- Exhibit III-L-3 demonstrates that only 40% of Prime's superminicomputer users are satisfied with their FE skill level, 40% are satisfied with their service overall, and only 29% are satisfied with their spare parts availability.

- Exhibit III-L-4 graphically demonstrates the clear segmentation in service priorities that Prime superminicomputer users report. While Prime meets or exceeds the requirements of the low priority services, Prime misses the mark for the higher priority services (FE skill level, parts availability, and hardware service overall). These high priority services have a far greater impact on a

EXHIBIT III-L-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
PRIME



HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING* 1985	USER RATING* 1986†
Documentation	-0.3	6.6	6.3
Training	0.0	6.8	6.8
Consulting	0.4	6.8	7.2
Engineer Skill Level	0.0	8.0	8.0
Parts Availability	1.0	6.9	7.9
Service Overall	0.2	8.0	8.2

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-L-2

1986 USER HARDWARE SERVICE RATINGS
PRIME

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	▨ 6.7	▨ 6.3	▨ (0.4)
Training	6.4	6.8	0.4
Consulting	6.6	7.2	0.6
Remote Support	4.8	7.3	2.5
Engineer Skill Level	▨ 9.1	▨ 8.0	▨ (1.1)
Parts Availability	▨ 9.3	▨ 7.9	▨ (1.4)
Hardware Service Overall	▨ 9.2	▨ 8.2	▨ (1.0)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-L-3

USER SATISFACTION: HARDWARE SERVICE
PRIME

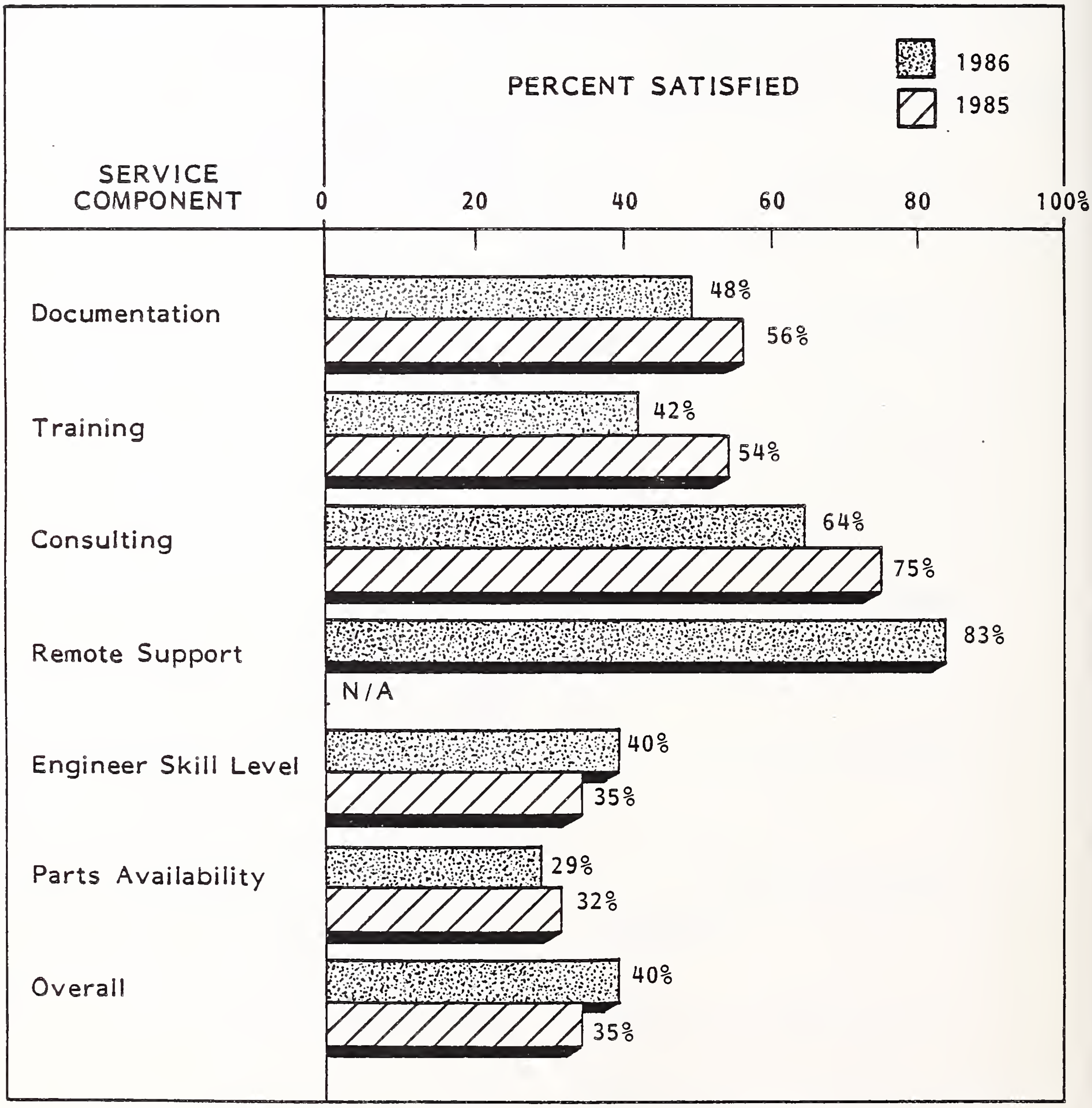
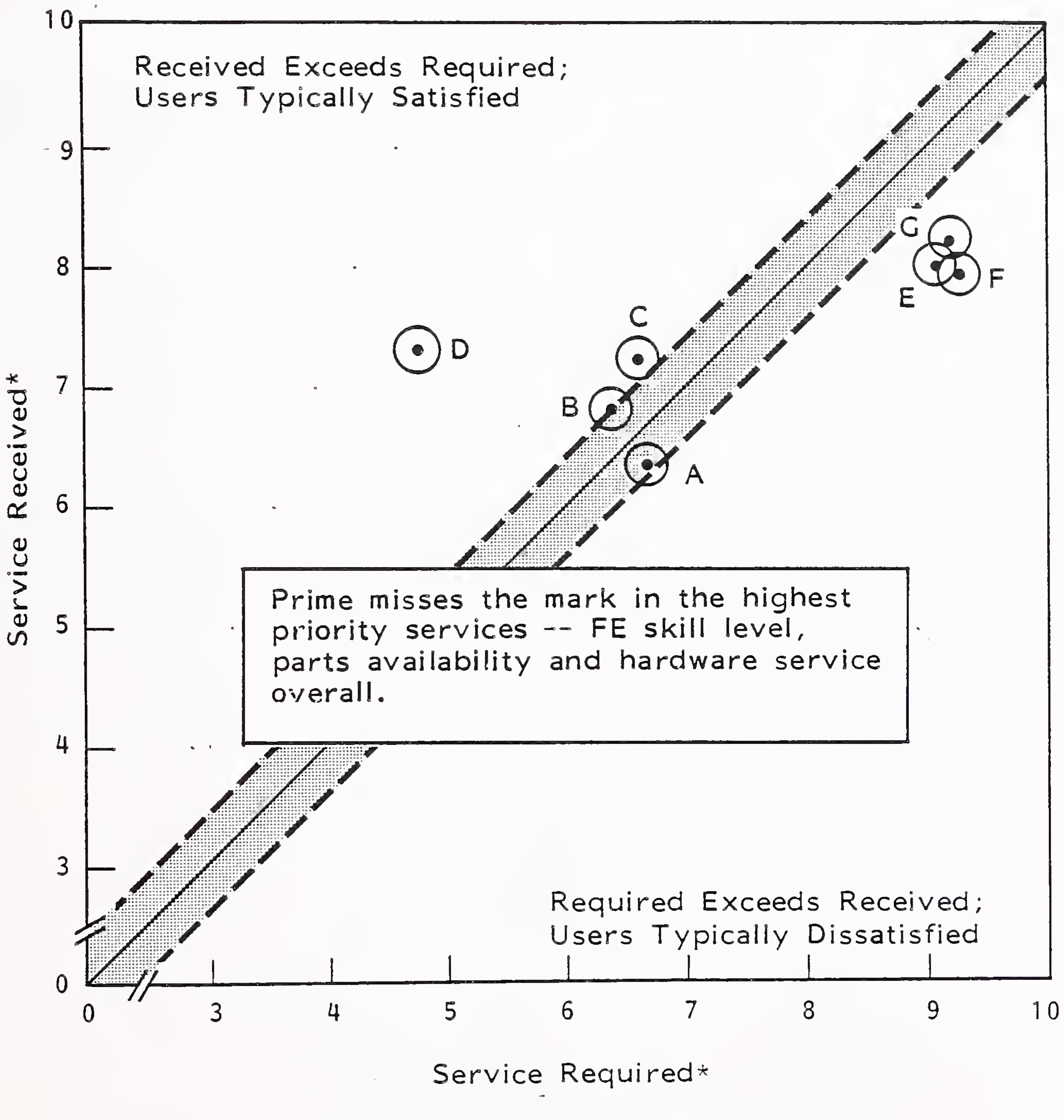


EXHIBIT III-L-4

HARDWARE SERVICES REQUIRED/RECEIVED
PRIME



A = Documentation
B = Training
C = Consulting
D = Remote Support

E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

user's overall service satisfaction, and, as such, should be an immediate area of concern for Prime.

- Exhibit III-L-5 shows that Prime's 1986 superminicomputer user ratings for systems software support received also did not vary much from 1985 to 1986. The one exception is software service overall, which dropped from 8.5 to 7.5. Exhibit III-L-6 helps explain this drop in overall software support satisfaction. First of all, Prime superminicomputer users have extremely high software support requirements in nearly every support category; second, Prime does not come close to satisfying any key software support requirement. Accordingly, Prime succeeds in satisfying a relatively small percentage of their users' system software support needs, as shown in Exhibit III-L-7. And since the superminicomputer market will become increasingly competitive on the software side, Prime should be extremely concerned about their users' perception of poor service. Exhibit III-L-8 highlights the gap in user actuals reported versus their requirement levels for system software support.

- Exhibit III-L-9 indicates that actual service performance, measured by system availability and response and repair times, is similar, if not better (in most areas), than last year's results. Even though user satisfaction with system software support declined, vendor responsiveness improved dramatically. Exhibit III-L-10 indicates that Prime meets or exceeds the current performance requirements of their users, with the exception of software response time, which is 33% slower than what the Prime users require.

- Perhaps as a reflection of the slower than required software response times received by Prime superminicomputer users, these users are relatively anxious to increase their own participation in software support, as suggested by Exhibit III-L-11. Prime superminicomputer users seem willing to install software patches when possible, and, to a greater extent, help in the diagnosis of problems. Prime should be able to take advantage of this willingness in attempting to meet the high software support requirements of their superminicomputer users.

EXHIBIT III-L-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
PRIME

SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE (Decline -1.5 -1.0 -0.5 / Improve 0.5 1.0 1.5)	USER RATING* 1985	USER RATING* 1986†
Documentation	0.2	6.6	6.8
Training	0.1	6.8	6.9
Consulting	0	6.8	6.8
Engineer Skill Level	-0.2	8.0	7.8
Service Overall	-0.5	8.0	7.5

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-L-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
PRIME

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	9.4	6.8	(2.6)
Training	8.1	6.9	(1.2)
Consulting	7.8	6.8	(1.0)
Remote Support	6.5	7.4	0.9
Engineer Skill Level	9.2	7.8	(1.4)
Service Overall	9.3	7.5	(1.8)

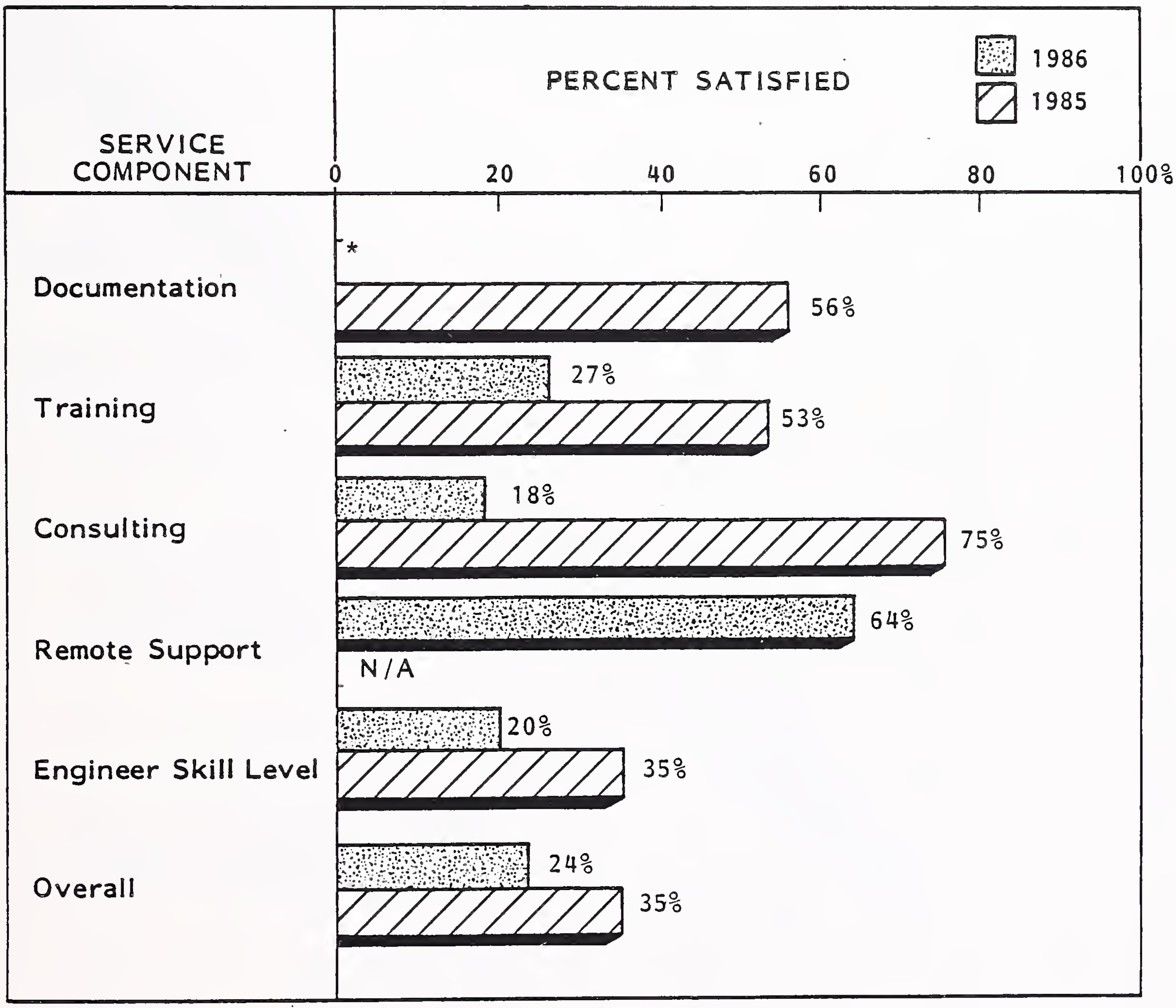
▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-L-7

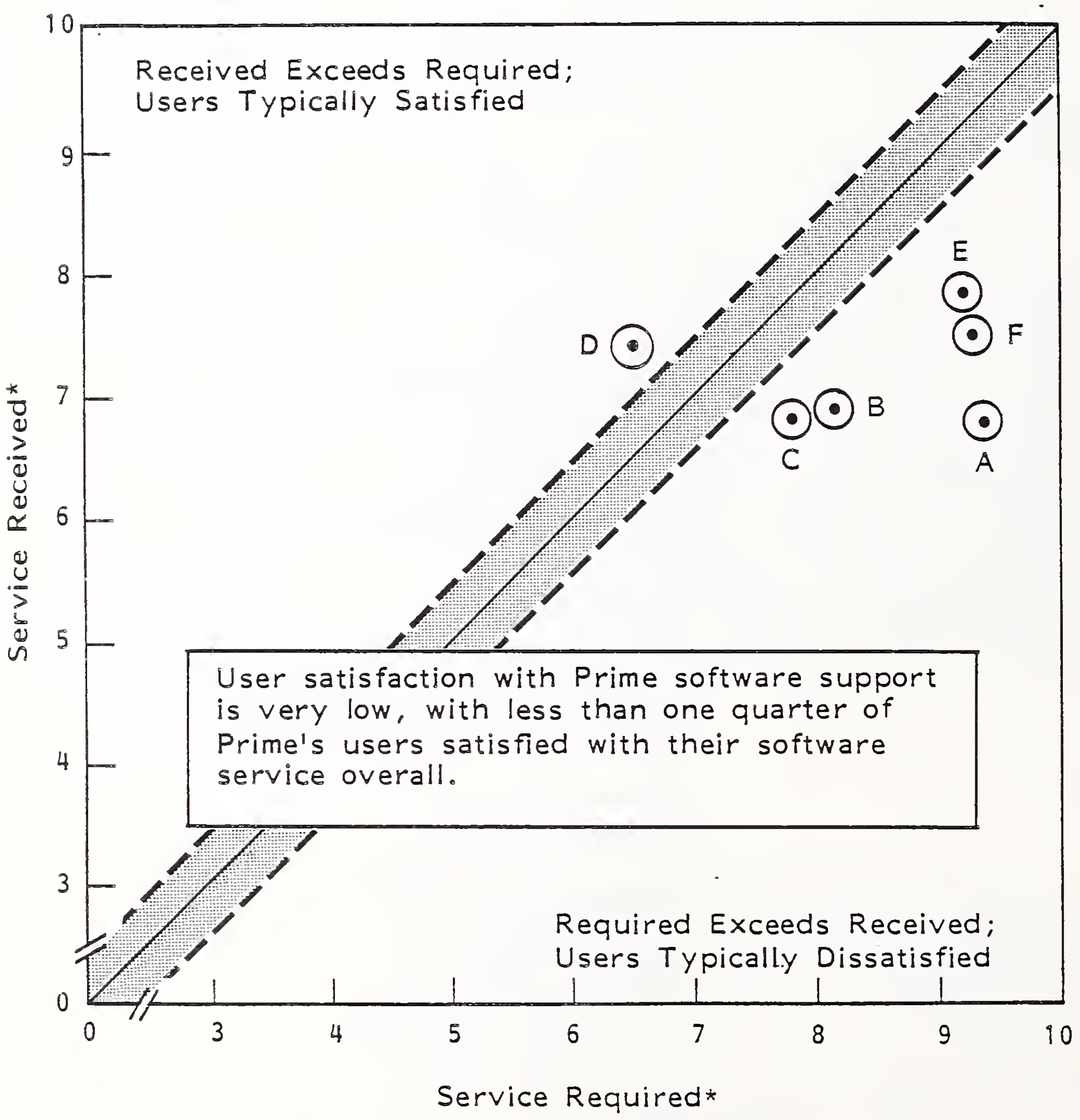
USER SATISFACTION: SYSTEMS SOFTWARE SERVICE
PRIME



*Insufficient response.

EXHIBIT III-L-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
PRIME



Received Exceeds Required; Users Typically Satisfied

Required Exceeds Received; Users Typically Dissatisfied

User satisfaction with Prime software support is very low, with less than one quarter of Prime's users satisfied with their software service overall.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-L-9

SERVICE PERFORMANCE
PRIME

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	98.3%	98.2%
Average Number of Interruptions		
Per Month (Number)	2.6	1.0
Percent Hardware Caused	44.0%	45.0%
Percent Software Caused	23.0%	11.0%
Average Hardware Response Time (Hours)	3.9 hr.	5.2 hr.
Average Hardware Repair Time (Hours)	4.7 hr.	4.6 hr.
Average Systems Software Response Time (Hours)	7.5 hr.	5.6 hr.
Average Systems Software Repair Time (Hours)	23.0 hr.	11.8 hr.

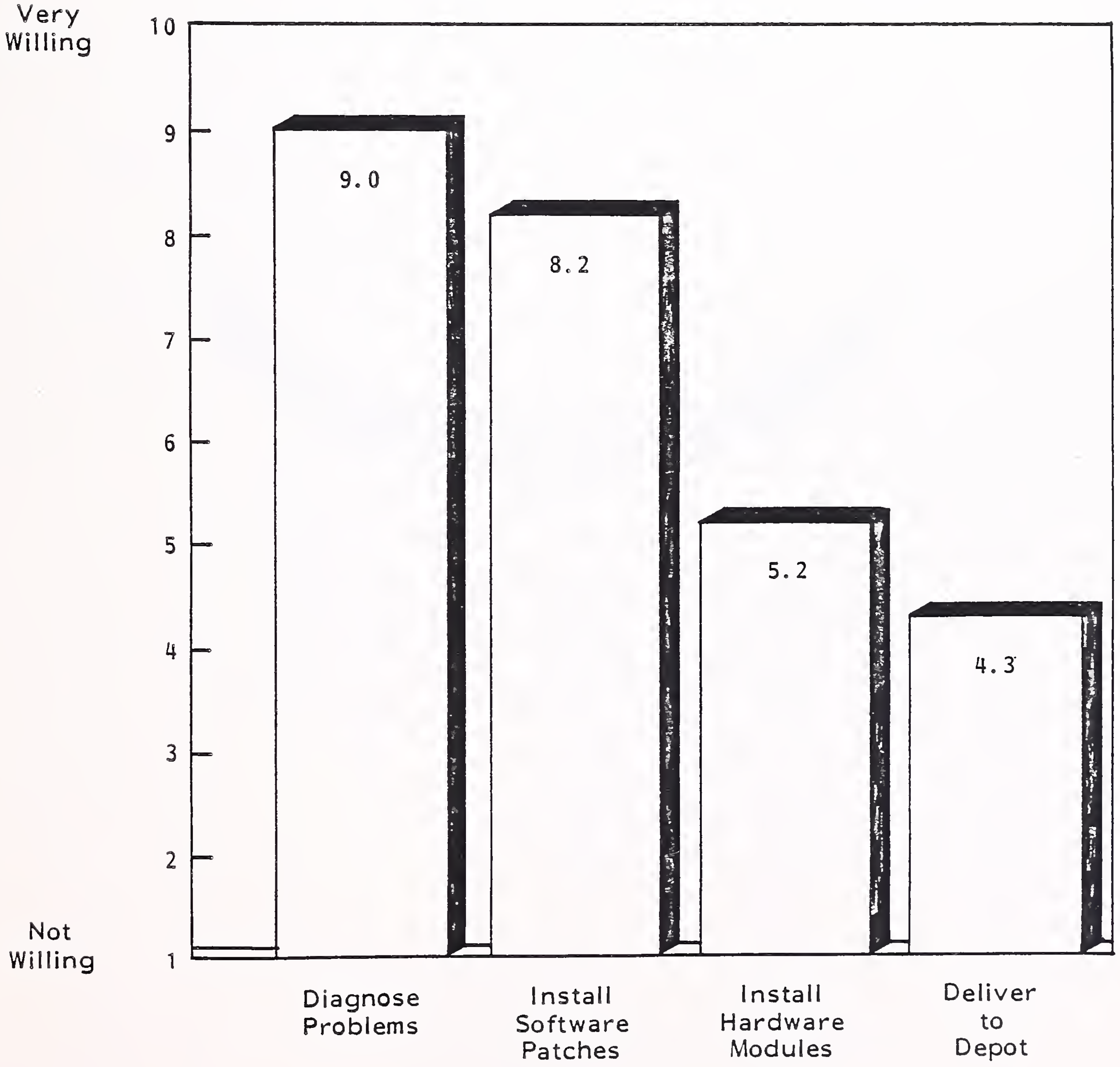
EXHIBIT III-L-10

USER EXPECTATIONS FOR SERVICE PERFORMANCE
PRIME

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent) Falls Short of Expectations	VENDOR PERFORMANCE (Percent) Exceeds Expectations
System Availability (Percent)	97.2	0	0
Hardware Response Time (Hours)	7.5		31%
Hardware Repair Time (Hours)	4.7		2%
Systems Software Response Time (Hours)	4.2	33%	
Systems Software Repair Time (Hours)	15.3		23%

EXHIBIT III-L-11

USER WILLINGNESS TO PERFORM MAINTENANCE
PRIME

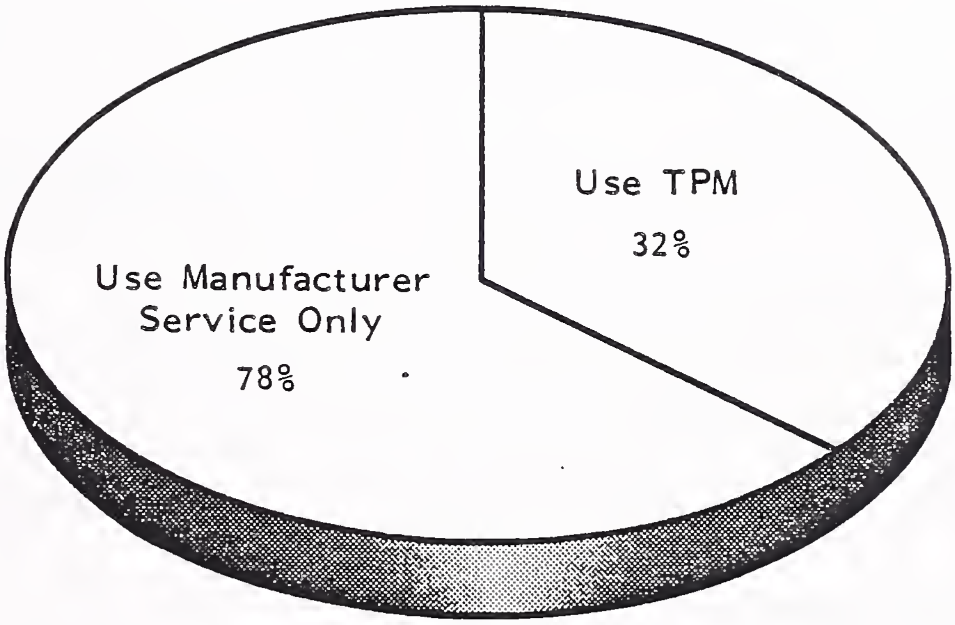


* Average Standard Error: 0.3

- Not surprisingly, a large number of Prime users are experienced with third-party maintenance, as shown in Exhibit III-L-12. Not all of these users are disgruntled customers, since a significant number of Prime users also use non-Prime peripherals in their systems. Exhibit III-L-13 demonstrates an extremely large percentage of Prime users who are attracted to the maintenance management (single source) concept.

EXHIBIT III-L-12

CURRENT TPM USE
PRIME



Almost one-third of Prime's users are experienced with third-party maintenance.

EXHIBIT III-L-13

USER REQUIREMENTS FOR EXTENDED SERVICES
PRIME

SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT* (Low 1 2 3 4 5 6 7 8 9 10 High)
Standby Coverage	40%	7.3
Remote Diagnostics	44	7.6
Preventive Maintenance during Non-Prime Hours	44	7.6
Deferred Response	12	7.3
Under Two-Hour Response	28	7.4
Maintenance Management	72	8.2

*Average Standard Error: 0.3

IV SMALL SYSTEMS SERVICE VENDOR PROFILES

- In the following section, INPUT will present in-depth profiles of 10 leading small system vendors' service operations. Each profile begins with standard directory information (i.e., address, key support management personnel, and revenue information as available). A background section provides pertinent past information as well as current happenings affecting the vendor's service business. A service demographics section presents revenue, employee, and organizational information and is followed by an explanation of the vendor's support offerings and programs. Finally, a discussion of the vendor's future service plans and direction concludes each profile.

- The profiles will be delivered in a single shipment and may be placed in the binder in alphabetical order as arranged.

SERVICE VENDOR PROFILE

AT&T INFORMATION SYSTEMS
Morristown, NJ 07054

Chairman: Robert Allen
Vice Chairman: Randall Tobias
Senior Vice President, Services:
Peter T. Milano

BACKGROUND

- As the communications giant entered the data processing market with the onset of deregulation in 1984, industry watchers envisioned the entry of a formidable competitor, capable of reckoning even with the likes of IBM. Although AT&T's participation in the industry has yet to cause a major threat to IBM's market share, the company has established itself as a key player in the market and managed to introduce a sizeable and diverse line of small systems over its past two years in the running.

- The Information Systems division has strategically played upon AT&T's strength as a telecommunications vendor, and a mid-1986 announcement of organizational change confirmed AT&T's continued commitment to the communications and networking focus of its computer business. The AT&T Information Systems and Communication (long-distance and networking) subsidiaries were melded into a new operational unit as FCC regulations which partitioned the operation of the customer premise and computer equipment units were lifted. The integration of the two operational divisions will allow AT&T to share both resources and ideas between the computer and communications groups (although accounting functions must remain separate by law) and will allow AT&T to leverage communication and network strengths to its advantage in the systems marketplace.

- New product introduction early in 1986 also highlighted AT&T's plan to concentrate efforts on communications in conjunction with computer offerings. The PC/PBX connection debuted in February as the first of a new family of products designed to integrate the AT&T personal computer line with digital private branch exchange systems. The Connection allows users to perform voice, data, and PC applications simultaneously with the PC acting as an integrated voice/data workstation, providing access to communication management functions of the system. The system, in line with AT&T's belief in the open architecture concept, can be used with MS-DOS and IBM PC-DOS operating systems as well as AT&T's own UNIX system.

- Taking advantage of an established reputation with major corporations as a telecom vendor, AT&T continues to target large accounts in the Fortune 1000 as its road into the data processing market. The new consolidated AT&T-IS and Communications sales operations will provide AT&T with a tool very well suited to serve the diverse needs of the business and commercial DP market.

SERVICE DEMOGRAPHICS

- In cost-cutting efforts in 1985, AT&T laid plans to eliminate up to 24,000 positions from its staff, approximately 30% of the cuts coming from its Services Division. In conjunction with the work force reductions, 14 AT&T-IS Service Centers are to be closed through 1986, leaving the National Service Center in St. Louis to handle the locations' previously localized duties.

- The number of AT&T Services Division telecommunications systems technicians dropped by 1,000 or more over the past year as these plans were implemented, but staff involved in the installation and maintenance of DP equipment increased, now numbering well over 2,000.

- A nationwide strike of unionized communications workers also stirred AT&T's Services Division in 1986 as support functions were left to management and non-union support staff until settlement was reached. The disagreement centered around proposed changes in job-pay structures dictated by AT&T as well as usual pension and pay-rate negotiations. The contract was signed after a 28-day walkout, providing AT&T with the right to add new lower-paying service job categories, and workers with increased salary and pension compensation as well as a job security/retraining plan.

SERVICE DELIVERY

- AT&T provides customers with a variety of flexible support plans after standard warranty periods (90 days for configured systems and one year for most other products) have elapsed.

  - Hotline Service provides users with access to AT&T support personnel to aid in the reporting, diagnosis, and resolution of both hardware and software problems. Remote diagnosis (and software fixes) are implemented in many cases while the user is on the line. Should a problem require further attention, the hotline staff will automatically release a field engineer to the user site without requiring the customer to place an additional call to a dispatch center. Hotline is a standard service provided during warranty terms and is included as a part of all maintenance contract agreements.

  - Business Day Service provides on-site coverage from 8:00 a.m. through 5 p.m., Monday through Friday, and additionally covers parts needed for any service outside of those hours. Hotline Service is also included, and response times of four hours for major troubles, 24 hours for less critical problems are attempted.

  - Around-the-Clock Service provides the same services as Business Day support, with the coverage period expanded to 24 hours, 7 days a week.

  - Dedicated technicians are available for support at a specific site, recommended for customers with a high volume of move and change activity. Dedication of on-site personnel can supplement a user's Around-the-Clock support or can be contracted as a separate service activity.

  - Service-Plus offers users the chance to allow AT&T to act as a single-point contact, managing all support activities at any number of a client's facilities. The AT&T contact will field trouble calls, assist in diagnosis or dispatch, escalate missed commitments, and oversee all calls through to resolution. This offering will undoubtedly be enhanced by AT&T's evolving third-party maintenance provisions.

- New systems developed from the coordinated efforts of AT&T's Communications and Information Systems Division will likely take advantage of its communication edge by way of increased use of remote isolation and diagnostic tools. User involvement in support is inherently encouraged through AT&T's wide use of hotline interaction in early stages of problem resolution, and increased operational efficiencies (as well as cost saving for customers) can be realized through the further integration of remote support into AT&T's service delivery.

SERVICE DIRECTIONS

- Improving its market focus in the way of support, AT&T Customer Service was expanded beyond traditional installation and maintenance offerings. ISM introduced a new category of professional services to AT&T computer and communication customers, including a total project management plan for users entering into the implementation of a new system, and technical consulting for ongoing assistance with system operations and performance assessment. New support centers offering customized software design and support are also accessible to clients with special systems needs.

- AT&T's announcement of its entry into the third-party maintenance market also came under ISM as a natural extension to its site management offerings. Quick to disown any attempts to group AT&T with other hardware vendors actively competing in the TPM arena, AT&T does not view itself as "in the third-party maintenance business" per se. Provision of support for customer-owned non-AT&T equipment will reportedly be done on a selective, case-by-case basis in attempts to satisfy market demands for a single-source support supplier.

- More recently, AT&T has announced a major realignment plan which will bring the AT&T Information Systems and Communication (customer premise) support groups together. The move, as part of a new strategic direction AT&T has set for the future, will focus accountability for the installation and maintenance of telecommunications and computer equipment and service to improve overall accounts coordination between the two product lines. Consolidation of the support functions will both benefit large account users through enhanced abilities to provide end-to-end service for complex networks as well as assist small business customers through closer coordination of services and sales.

- Among the priorities in AT&T's future direction include a drive to strengthen and enhance the profitability and market position of the company's core businesses (i.e., long-distance services and design, manufacture, and sale of network and customer premises telecommunications equipment) and the establishment of a major position in international markets. The company intends to build upon AT&T's established strengths and reputation to position itself as a key supplier of a new generation of data networking solutions to the customer.

SERVICE VENDOR PROFILE

CONCURRENT COMPUTER CORPORATION
15 Main Street
Holmdel, NJ 07733

President and CEO: James K. Sims
Vice President, Services: Joe Rechner
Revenues, Fiscal Year 1985:
$245 Million

BACKGROUND

- In November 1985, the Perkin-Elmer Corporation spun-off its data processing systems operation, introducing a new name to the list of competitors within the superminicomputer marketplace--Concurrent Computer Corporation. Carrying on the responsibilities and commitments of Perkin-Elmer's Data Systems group, the company ran public with its announcement of common stock availability in December, with Perkin-Elmer retaining an 83% holding in the company's ownership. The move was interpreted as an effort on Perkin-Elmer's part to increase the visibility of its 32-bit supermini and parallel processing lines in the face of increasing competition in the field.

- The new corporation took over 3,000 former Perkin-Elmer Data Systems employees into its manufacturing, marketing, and support operations. However, unexpected business downturns, fueled by low order rates and late deliveries experienced in early 1986, forced cost-cutting actions which reduced staff by 7% overall, the majority of the layoffs felt within manufacturing.

- Concurrent Computer, following the strategic path of the P-E Data Systems group, takes a niche approach to the competitive supermini market, concentrating efforts in the scientific and technical markets well known by Perkin-Elmer as a corporation. As Concurrent establishes name recognition and its own reputation in the industry, the corporation will likely extend efforts more aggressively into the commercial and business marketplace.

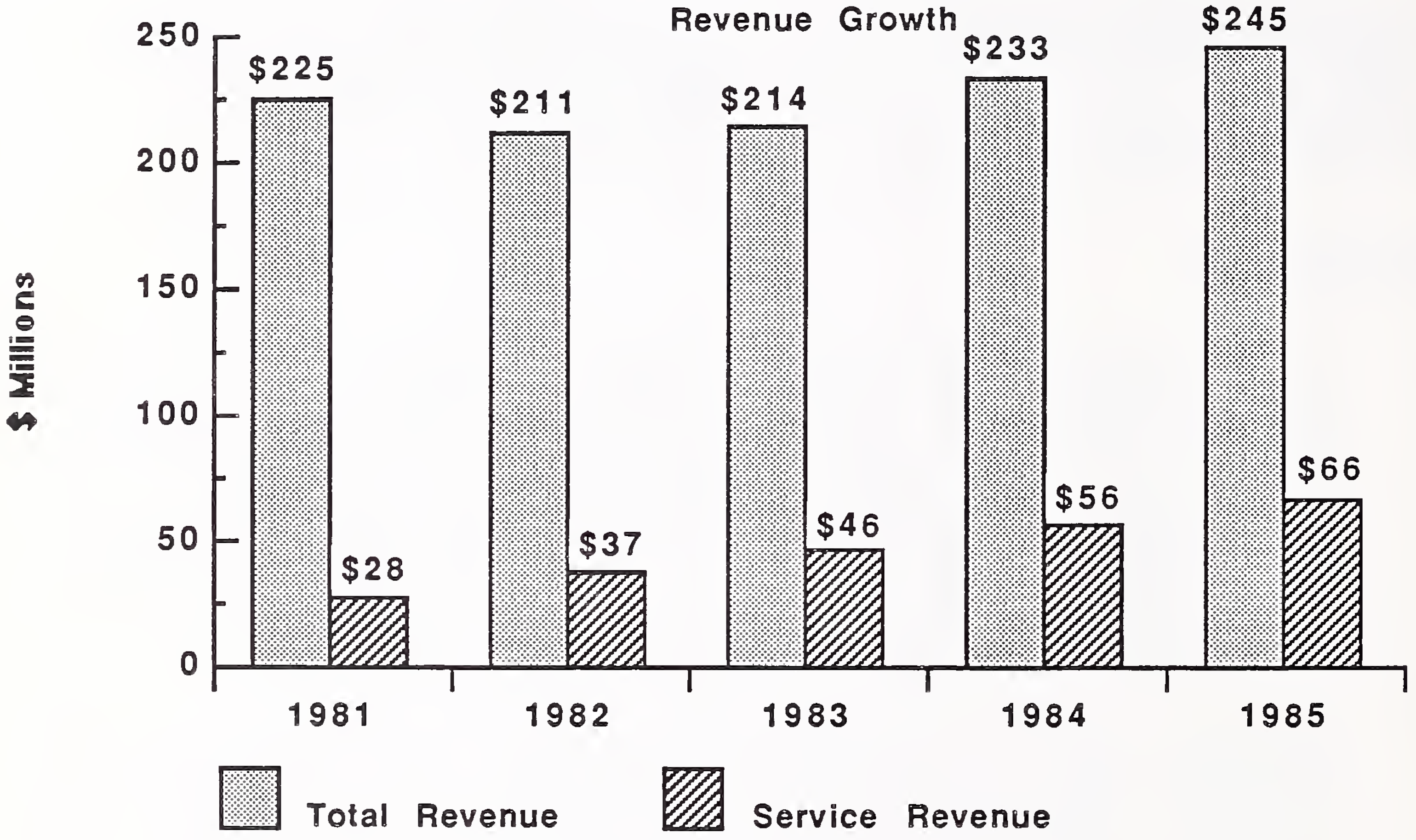
SERVICE DEMOGRAPHICS

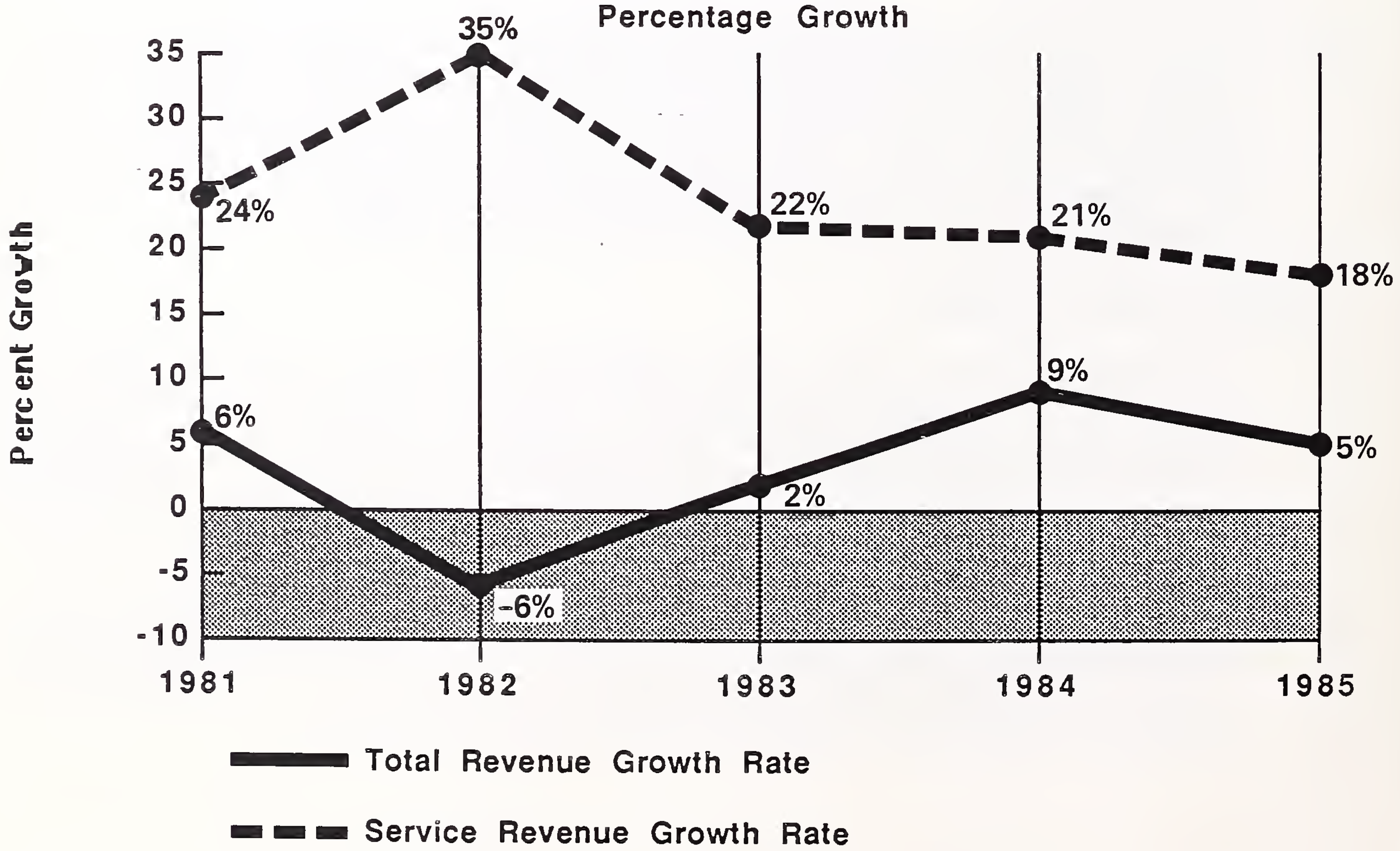
- Concurrent divides support responsibilities between four regions in the U.S., and currently maintains approximately 70 offices nationwide. Operations at each location are directed by basically the same executive staff that managed Perkin-Elmer's Data Systems group before the spinoff occurred. Concurrent's customer service workforce numbers 650 domestically, with 150 employees internationally stationed.

- Concurrent's revenues from support services, as compared to Perkin-Elmer's Data Systems figures from previous years, rose by $10 million over fiscal 1985, although the growth rate, stymied by slowdowns felt throughout the industry, fell by 3% from 1984 to 1985 (see Exhibit IV-B-1).

EXHIBIT IV-B-1

PERKIN-ELMER/CONCURRENT'S REVENUE AND PERCENTAGE GROWTH





SERVICE DELIVERY

- Concurrent, sensitive to the wide range in support needs between technical and commercial users, provides a number of service programs designed to accommodate its user base. A variety of service options provide appropriate levels of support to self-maintaining users as well as full coverage for non-supporting customers. Service plans currently offered by Concurrent include:

  - Product Repair Service, one of three programs geared to the needs of users who maintain the majority of their system components, offers an alternative repair service at fixed rate prices for all Concurrent/Perkin-Elmer assemblies, peripherals, modules, or third-party add-ons, and an option to receive module updates and revisions.

  - The FASTBACK Module Repair Service helps self-maintaining customers meet their sparing requirements through guarantees of five-day turnaround on module repairs and expedited air freight returns. Parts leave the Concurrent facility fully tested and warranted for 90 days to assure that a reliable unit is being returned to the user's inventory.

  - A third option available to self-servicing customers is the Emergency Exchange Service, which assures expedited shipment of critically required assemblies. Replacement parts installed with the most current revision level are shipped to user sites and also warranted for 90 days. Users call the National Logistics Center with their request, and needed parts are located and shipped within the same day.

  - For more traditional maintenance support, Concurrent provides four separate plans--Primary, Limited, Comprehensive, and Comprehensive-Plus. Primary Service supplies users with unlimited access to a hardware support hotline, service through Concurrent's Remote Technical Assistance system, as well as on-site support during the customer's chosen hours of coverage. Response times and preventive maintenance periods are also tailored to suit particular customer needs.

  - Limited Service contract customers are allotted a specified number of on-site calls throughout the term of their agreement, based on the size and complexity of their system. Preventive maintenance, hotline assistance, and remote diagnosis are also included in the fixed monthly fee.

  - Comprehensive and Comprehensive-Plus offerings provide users with critical applications a 95% or 98% uptime guarantee, backed by a premium refund agreement in the event of missed commitments. On-site hardware and software support is provided as needed, with response times quoted at four hours or less.

- Service on a per-call basis is also available to users, with a Catastrophic Protection clause available to insure against the high costs of per-call support in the case of a major system malfunction. Catastrophic Protection can be purchased at a fraction of what a full coverage monthly contract would cost, and provides the customer with a ceiling amount (equal to the price of standard contract coverage) for any major service call. Per-call users employing Concurrent's Protection plan also receive regularly scheduled preventive maintenance and access to remote diagnostic tools, as well as a priority allocation of locally inventoried spares.

- Software support options offered by Concurrent include:

    - Comprehensive support through the Software Service offering, which supplies toll-free phone support from Concurrent's national center in Neptune (NJ), on-site support when needed, access to remote diagnostic and fix technologies, as well as automatic updates, revisions, and changes to software and documentation. A Software Subscription Service is also included that gives a synopsis of upcoming changes and current field information.

    - Concurrent also allows software support components to be unbundled and purchased separately, providing users with the components needed to build a software support plan suited to their particular needs.

    - The Extended Software Maintenance contract supplies the essential update and revision services, as well as a subscription to Concurrent's software publication and documentation updates. Telephone hotline assistance can be added to the package to provide any needed backup to users maintaining their own software.

SERVICE DIRECTIONS

- With the wide range of support offerings currently provided, Concurrent should find its customer support a strong selling point as the company attempts further penetration into the business marketplace. Even though Concurrent currently emphasizes more technical markets, the flexibility of its service menu will provide commercial users the flexibility they demand.

- While still incorporated as the Data Systems division of Perkin-Elmer, the organization announced its entry into third-party maintenance in mid-1985, as a step toward providing customers with a single-source for service of their mixed-vendor systems. Users who have integrated non-Concurrent units into their systems are offered the same standard of support for these components as Concurrent offers to its own units, with comparable inventories, technical assistance, and response times provided, as well as associated uptime guarantees. Currently covered under the new program are a number of central processing units, disk drives, and other system modules from Ardent, Micos, Intel, Fujitsu, Century Data, Macrolink, Dataram, Tecstor, and Western Peripherals.

SERVICE VENDOR PROFILE

DATA GENERAL CORPORATION
Westboro, MA 01680

President: Edson D. DeCastro
Senior Vice President, Worldwide Field Engineering: Frank P. Silkman
Revenues, Fiscal Year 1985: $1.2 Billion

BACKGROUND

- Following optimistic indications from 1984 growth rates, Data General faced a challenging year in fiscal 1985. Weak demand industrywide left DG geared for high rates of production only to see the promising 40% growth in 1985 revenues plunge to 7% in 1986 (see Exhibit IV-C-1). Layoffs and plant closings reduced DG's workforce by 1,400 last year, and despite commitment to expansion into the service-demanding commercial market, approximately one-third of its engineering staff were involved in the layoffs.

- Functional changes in Data General's Customer Service Division also contributed to this reduction in support personnel, as consolidation of a number of product support groups eliminated overlap in functional areas and centralized service locations.

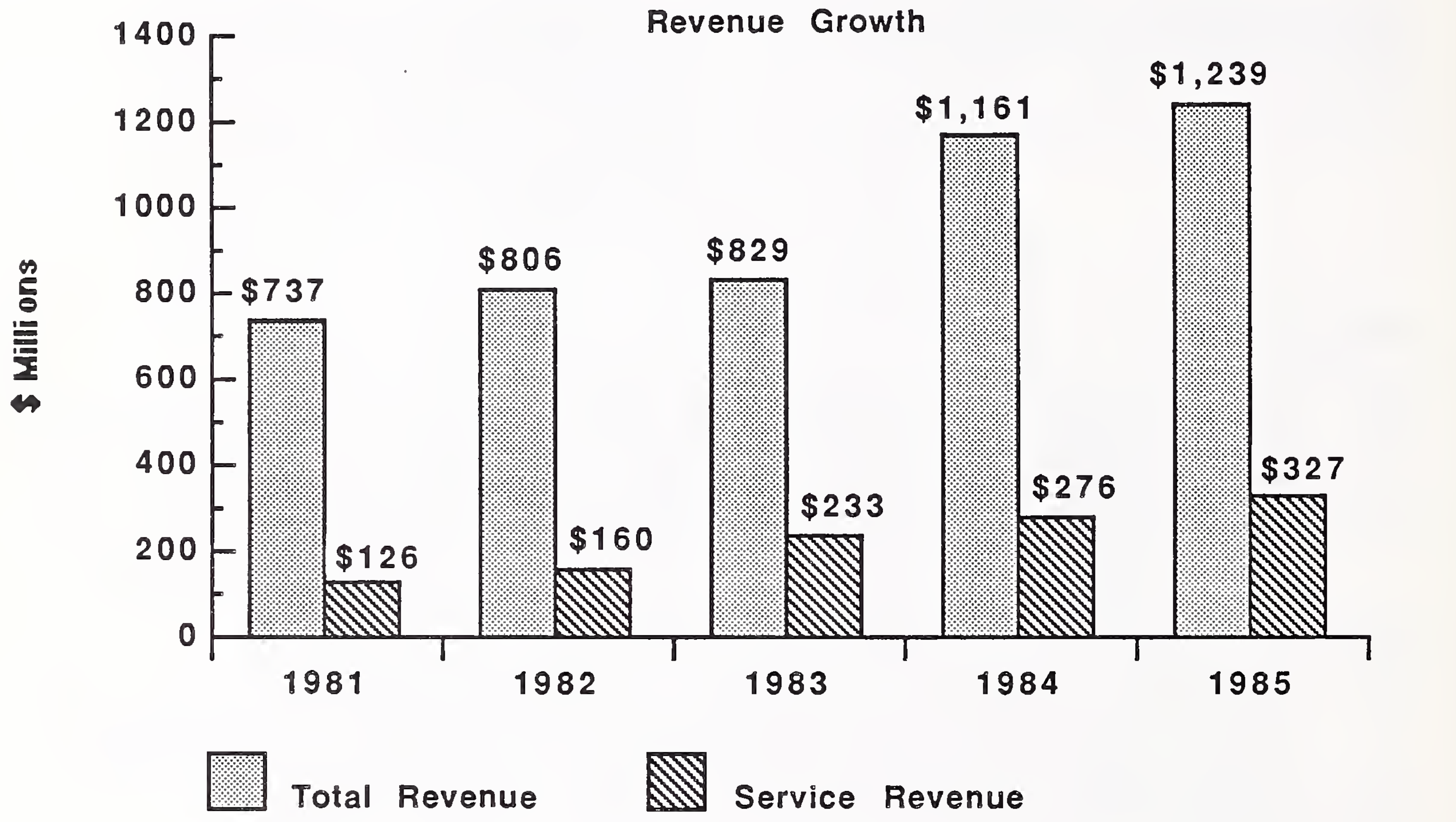
- Other functional divisions of Data General became a target of change over the past year as the company structure evolved to suit its commercial target markets. A new organization, Business Group Marketing, was formed in 1985 to draw together industry and product strategies in planning, marketing, and support functions. Of this group, an Information Systems Division takes responsibility for Fortune 2000 commercial markets and related support functions.

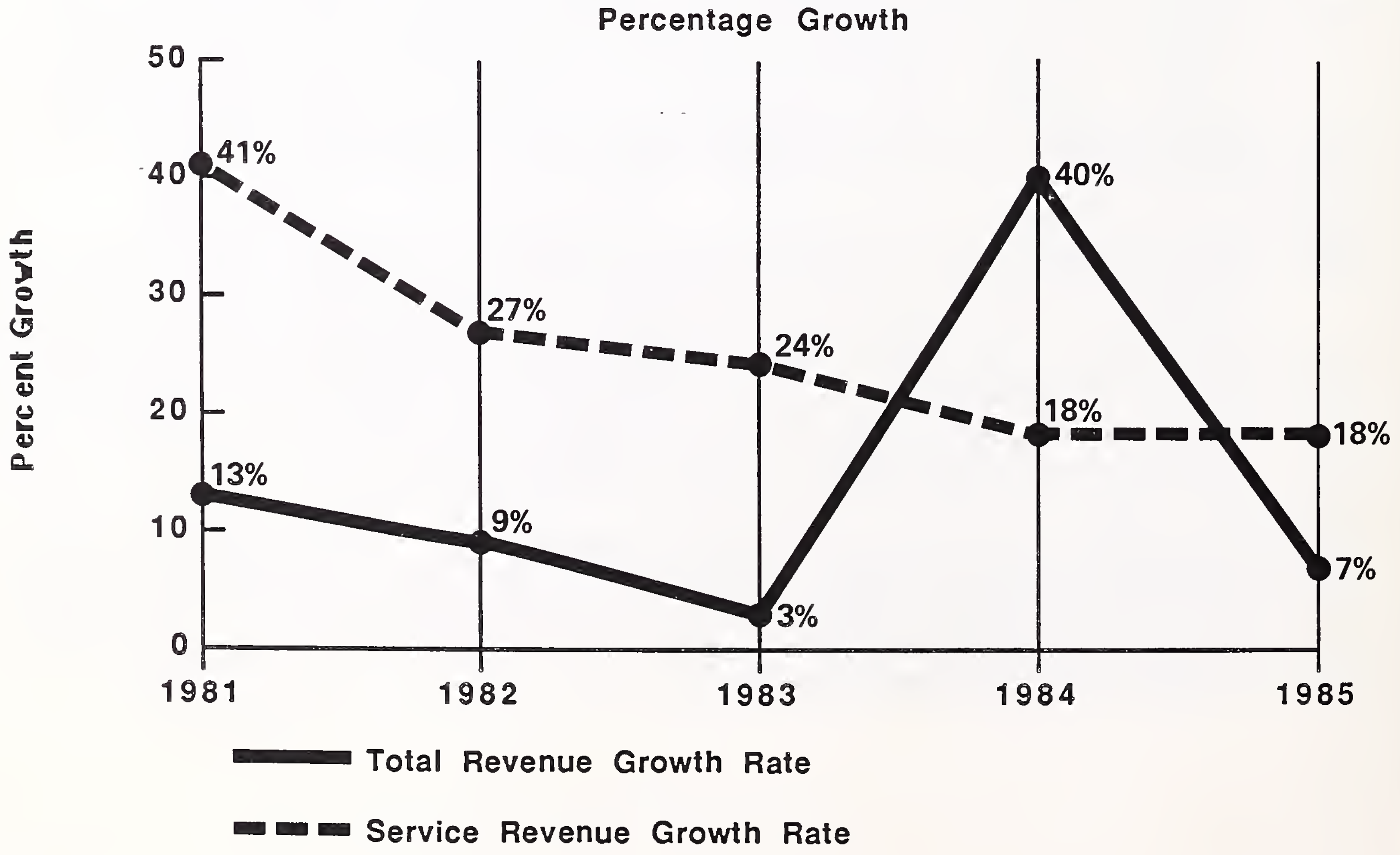
- The Desktop Division became the renamed Distribution Division in another 1985 effort to recognize DG's expansion into new channels of distribution for its end-user- and corporate-aimed products. Marketing Data General products to small- and medium-sized businesses, the Distribution Division focuses efforts on third-party channels, including VARs, distributors, dealers, and third-party software firms. Expanded sales and management programs are offered to assist DG representatives in their sales efforts.

- Expansion of the successful ECLIPSE line continued over the past year, with a total of six newly released models of the MV family of superminicomputers. The new MV/20000 incorporates emitter coupled logic (ECL) and transistor-to-transistor logic (TTL) gate arrays in a hybrid technology, further extending the performance of its supermini line.

EXHIBIT IV-C-1

DATA GENERAL CORPORATION'S REVENUE AND PERCENTAGE GROWTH





- Other additions to product line included two series of technical workstations for engineering and design applications, higher capacity disk and tape storage systems, the TEO (Technical Electronic Office) system, and new DASHER units as intelligent workstation DASHER/One and the DASHER D555 integrated voice/data workstation were released.

SERVICE DEMOGRAPHICS

- Data General's Customer Service Division is currently staffed by 1,400 engineers. Over three-quarters of this engineering workforce make up DG's hardware support crew (a total of 1,100 FEs), the remaining 300 are involved in software support, including hotline staff.

- Reorganization of Data General Field Engineering in 1985 involved the consolidation of all North American hardware and software phone support services at DG's Norcross (GA) facility. All troubleshooting calls are fielded through this centralized location, and both hardware and software hotlines are staffed 24 hours per day.

- Plans to meld product repair and logistics functions also began to take shape last year as DG's central location in Fountain (CO) went under transformation. This consolidation will serve to reduce duplicate functions within the Field Engineering group as well as reduce spare parts inventories nationally.

- Despite the noted decline in overall revenue growth (see Exhibit IV-C-1), this revamping of DG's Field Service organization kept service revenues steady, with a flat growth rate of 18% in 1985. (Note: Figures for 1983 and 1984 service revenue, as shown in Exhibit IV-C-1, have been adjusted from previous reports to coincide with Data General's figures as restated in their 1985 Annual Report; percentage growths shown have been adapted accordingly.)

SERVICE DELIVERY

- Hardware support options available from Data General include:
    - On Call Service: standard preventive and remedial maintenance provided for 9 to 24 hours daily, with all calls fielded through DG's newly centralized support center in Georgia.
    - Remote Assistance: on DG's larger units, providing assistance in diagnosing unit failures and dispatching prepared FEs to user sites.
    - Hardware Subscription Service: DG's "REV-UP," delivering documentation and materials updates to users as a yearly subscription package.
    - Depot Service: with repairs planned to be exclusively handled soon at DG's Colorado central repair facility and invendory center.
    - Per Call Service: available as needed at time and material rates between $95 and $100 hourly.

- Newly introduced in 1985 was a Cooperative Maintenance Service aimed at VARs, large organizations, and other customers capable of performing self-maintenance. The CMS program includes spare parts provision, depot repair service, diagnostics, documentation, training, tools and test equipment, as well as service planning and DG back-up support to qualified customers.

- Spare Mail, a newly offered exchange and repair service for DG spare parts, provides three levels of expedited mail-in support to systems customers. Ranging from emergency next-day delivery to economic three week turn-around, Spare Mail Express through Spare Mail Saver options include automatic installation of the latest ECOs on the component.

- Data General's support offerings for software were also expanded over the past year, upgrading previous options to make on-site software support standard to Software Product Service customers. The enhanced support was made automatically available to customers with a current agreement in addition to access to DG's On-line Information Service, providing users with DG product and service information 24 hours daily.

SERVICE DIRECTIONS

- With recent movement into new business and commercial markets, Data General has come to recognize the higher support needs of these users, as opposed to DG's traditional scientific and technical target communities. The streamlining of DG's field organization, as well as the enhanced and increasingly flexible support offerings introduced over the past year show the positive attempt by DG to compete via service, as well as product demanded by users in this marketplace.

- Senior Vice President of Worldwide Field Engineering at DG, Frank Silkman, evidences improved service technologies being developed by hardware manufacturers like DG as the vendors' stronghold against encroaching independents and third-party competition. Seeing reliability and maintainability becoming part of the engineering process, Silkman believes these technologies are placing increasing pressures on outside competition in their ability to provide competitive diagnosis and repair in an acceptable timeframe.

- Although recognizing the threat of third-party maintainers as well as competing manufacturers willing to provide single-source maintenance, DG has no eminent plan to provide service to other vendors' equipment, but will reportedly keep a watchful eye on competition in this area.

SERVICE VENDOR PROFILE

DIGITAL EQUIPMENT CORPORATION
146 Main Street
Maynard, MA 01754

President: Kenneth Olsen
Vice President, Field Service:
Richard Poulsen
Revenues, Fiscal Year 1985:
$6.7 Billion

BACKGROUND

- 1986 marked Digital Equipment Corporation's 25th year of business, providing the commercial, financial, and engineering/scientific marketplace with a variety of networked minicomputer systems and associated peripherals. The early 1970s saw the introduction of the initial stage of DEC's Digital Network Architecture, DECnet, providing a complete protocol for integrating separate computers into a single working system. In the mid-1970s, DEC expanded its line with the development of an architecture for a 32-bit computer as the first of the VAX family came to market. The system's VMS software was developed with the functionality of its networking capabilities in mind.

- Later in the 1970s, DEC advanced users' abilities to interconnect computing and storage units of various sizes with the development of the multiprocessing technology known as VAX clustering. Allowing separate and varied systems to share a single data base, VAX clusters' expandable networks of minicomputers and peripherals combine ultimate flexibility with potential for processing power equal to a large mainframe system.

- DEC continues to expand users' networking capabilities with recent product additions at each end of the scale. Seven hundred new high-end VAX 8600 (12 MIPS) parallel processors were shipped in 1985, virtually all equipped for clustering/networking applications. At the low end, the new DEC micro PDP 11/53 was released with twice the performance capacity of its predecessor (the entry level PDP 11/23) at about the same price. Additionally, price reductions of up to 70% on all add-on memory units for VAX and PDP-11 systems were implemented in August of this year.

- The introduction of additional mid-range units, the VAX 8700 (7 MIPS) and 8550 (4 MIPS) is expected in 1986, as well as the addition of an IBM compatible PC VAX mate equipped and marketed for network integration.

- Support for DEC products was also enhanced in 1986 with an extended one year (versus standard 90 day) warranty provided on VAX 8000 series units (excluding the two high-end VAX 8600 and 8650). Additionally, response commitments on high-end VAXs were augmented as two-hour response on 8600 and larger systems service calls became standard in mid-1986.

SERVICE DEMOGRAPHICS

- DEC, in an ongoing effort to provide the integrated support demanded by networked systems, consolidated its Software Product Services with the Field Service division, creating a single group responsible for all post-sales support.

- In conjunction with this organizational integration, a new, expanded Customer Support Center was opened in June 1986, housing both hardware and software support specialists and facilities. The 50,000 square foot site located in Colorado Springs houses a staff of 600 and includes 30,000 square feet of problem simulation lab space where on-site system failures can be recreated and fixes determined remotely on the Center site.

- Although service revenue growth declined somewhat in 1985 (see Exhibit IV-D-1), the field service reorganization effort included additions to DEC's support staff, now nearing 30,000 worldwide. DEC maintains an approximate total of 450 support locations, including 200 sites in the U.S.

SERVICE DELIVERY

- DEC's approach to service provision is based on its perception of network product life cycle.

    - The initial planning stage requires design consultation in both system logic and performance assessment as well as in physical site planning. DEC provides strategic advice in all needed areas, from the defining of system parameters to actual facility design and construction management (a new offering known as DECsite).

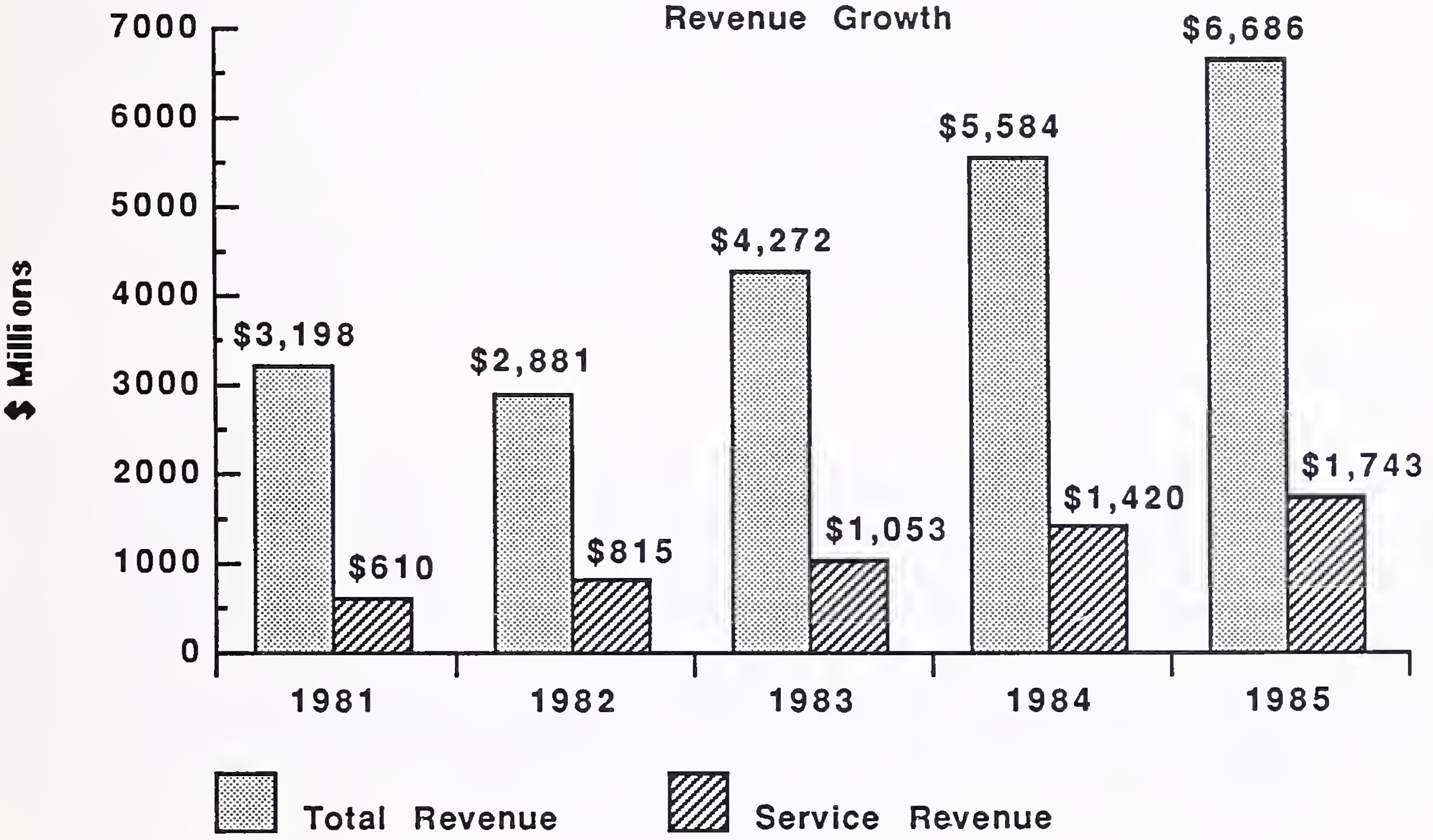
    - The implementation of the network plan initiates stage two. DEC systems specialists can oversee all construction and installation processes including cabling, inspection, and certification of the system. DEC will coordinate all aspects of the installation through its own or subcontracted expertise and assures smooth introduction of the network with full system support, training, and documentation available through DEC Start-up Services.

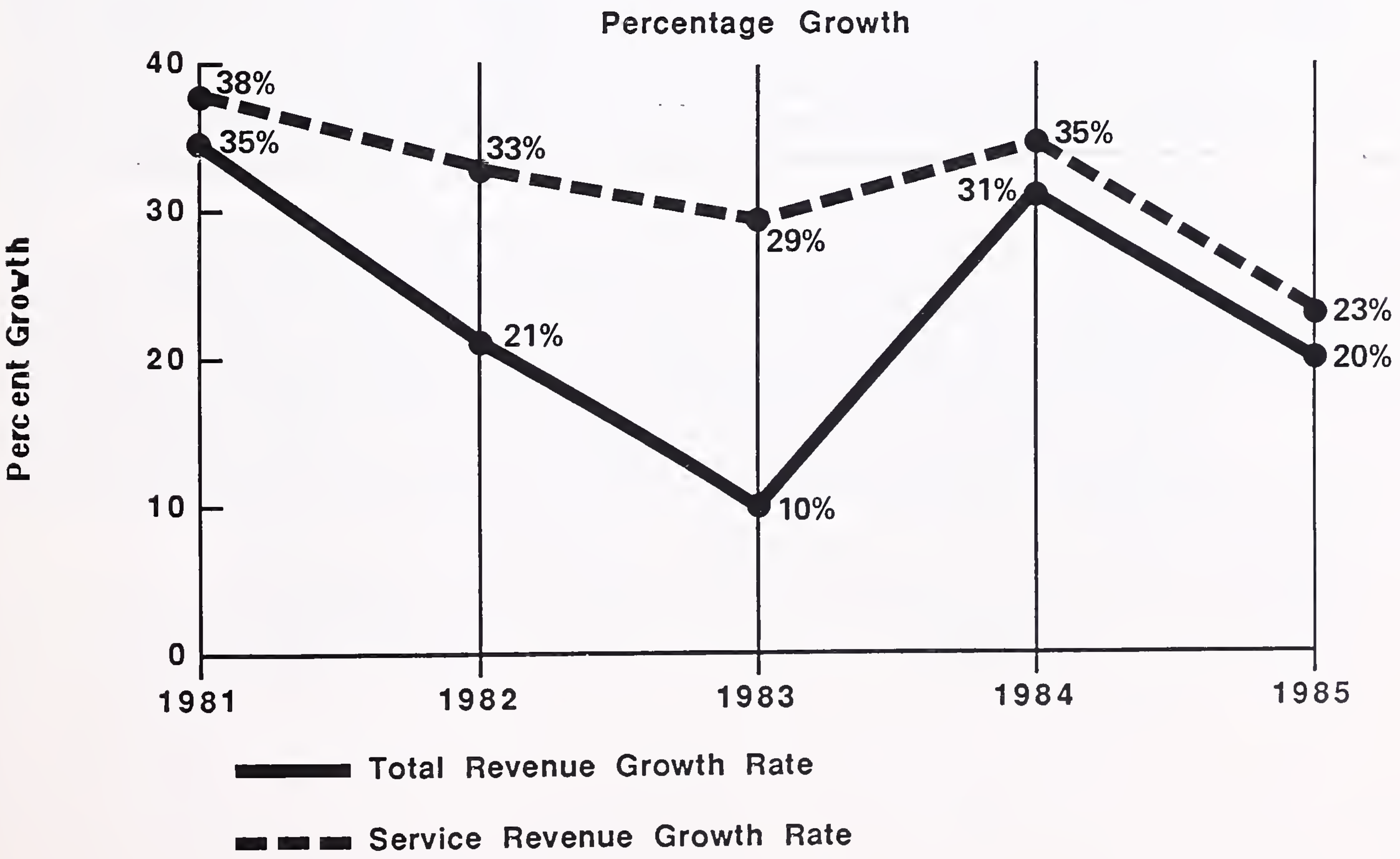
    - Stage three of the life cycle involves the support of ongoing network operations with traditional remedial as well as preventive maintenance and revision installation. According to user needs, varying levels of both hardware and software support can be contracted ranging from full DECservice coverage to DECmailer depot repair and self-maintenance options. Network monitoring and analysis tools, such as VAXsim system self-diagnostic, Observer network monitoring software, and the ETHERnim LAN management aid are provided to assist users in network operation.

- DEC provides a host of additional services outside of traditional consulting and maintenance. Extensive training programs are available in each stage of the life cycle, ranging from introductory user levels through technical repair

EXHIBIT IV-D-1

DIGITAL EQUIPMENT CORPORATION'S REVENUE AND PERCENTAGE GROWTH





and management seminars; media maintenance and storage is provided both at user sites and secure DEC sites; disaster recovery planning and protection is also available through DEC. Recoverall, a comprehensive equipment "insurance" program, provides immediate replacement for equipment and software systems in the event of accidents, including those not normally covered by system maintenance or traditional insurance policies.

- In line with DEC's integrated approach to network service, a new support product is slated for delivery in late 1986. Preliminarily dubbed NETcare, the offering was announced in February 1986 and will provide a single point of total network management with DEC coordinating all system support tasks through DEC services or as a broker of another provider's support.

SERVICE DIRECTIONS

- DEC, in both products and service development, will continue to focus its efforts in the network arena. In recognition of DEC's committed level of service to its network users, DEC will be expanding its ranks in the field as well as improving remote capabilities and tools. Interaction between the two modes of support will be enhanced by the consolidation efforts within the service organization and the Colorado Springs facility as responsibility and expertise become increasingly shared. DEC foresees continued cross-training between its hardware and software engineering staff, resulting in a team of systems specialists capable of providing support for the entire network system.

- As DEC implements its overall operational strategy of becoming a complete service vendor for DEC customers, the concept of network management will be central. Comprehensive support offerings, such as the new NETcare and DECsite programs, will continue to be developed and fine-tuned in response to customer needs. DEC's response to single-source maintenance demands, the DECompatible program, has expanded to include 175 non-DEC units at the corporate level, and reportedly provides support to nearly 700-800 more at the local level.

- A spokesman from DEC's Field Service Division sees systems support becoming increasingly expertise-oriented, leaving service as strictly technical maintenance performance behind for more "pro-active" forms of support. Trends toward more consulting-oriented service offerings are expected to continue, and although these services will not displace traditional contractual products, demand for professional services--from planning stages through maintaining ongoing performance--will play an increasing part in DEC support strategy.

SERVICE VENDOR PROFILE

GOULD COMPUTER SYSTEMS DIVISION
6901 West Sunrise Boulevard
Fort Lauderdale, FL 33310

President: C. Shelton James
Vice President, Customer Services:
E. G. Sheperd
Director, Field Operations:
D. L. Bastress
Revenues, Fiscal Year 1985
(Information Systems Section):
$269 million

BACKGROUND

- In 1986, Gould Incorporated, in a strategic decision to divest resources not critical to a new commercial focus, made moves to sell its defense systems business and, earlier this year, completed the sale of electrical controls operations and Measurements System 5 Division, and downsized its holdings in the semiconductor sector. Planning to concentrate resources on areas of commercial electronics offering high-growth opportunities as well as common marketing and technological strengths, Gould will shift emphasis toward information systems, industrial automation systems, test and measurement and electronic components, and materials business.

- Gould Computer Systems Division (CSD) will, as part of this new strategic emphasis, become a more central concern within the corporation. CSD, teamed with Gould Imaging and Graphics Division, comprises the Information Systems Business Section. The Computer Systems Division, based in Fort Lauderdale, deals in the design and manufacturing of high-performance minicomputers, UNIX-based systems, and productivity systems marketed to a wide range of engineering, scientific, and industrial markets.

- Gould introduced a variety of products to the market over the past year. New releases from its Computer Systems Division included:

  - The introduction of three new UNIX-based superminicomputers, including the low-cost PowerNode 6040 Model 1, the expandable Model 2, and a PowerNode 9050-SP for scientific applications.

  - An array of new software, including the Network File System, working with Gould's PowerNode processors to create a true distributed file system, and HyperSearch, a high-speed text retreival system. One of the industry's first secure UNIX operating systems in the UTX/325 program and SCI-Clone/32 parallel processing software systems were also introduced.

SERVICE DEMOGRAPHICS

- Although light layoffs in the Computer Systems Division were experienced in manufacturing and design centers, CSD's Service Organization remained stable at approximately 650 employees, nearly 400 providing support in the field.

- In efforts to more closely align the operations of the two groups comprising Gould's Information Systems Busienss Section, the Customer Service organizations of the Imaging and Graphics and Computer Systems Divisions are scheduled to consolidate in the near future to better support a broader range of Gould products in the field. The merger of the operational units will add approximately six support locations to CSD's 10 regional and 40 local office totals.

SERVICE DELIVERY

- Gould provides a wide variety of support offerings, ranging from Total System Support down to the Subassembly Exchange level:

  - Comprehensive on-site systems support is offered for both hardware and software through Total Systems Support. High-priority response for critical applications as well as preventive and remedial maintenance, centralized software support, and engineering change management are supplied as part of TSS.

  - Comprehensive Hardware Maintenance supplies traditional on-site support eight hours, five days a week, coordinated by an assigned Gould account manager. Priority response to problem calls is provided, and options extending shifts to 24-hour, 7-day coverage are available.

  - Basic Hardware Maintenance Service is available for any CSD CONCEPT/32, PowerNode, or Productivity System which contains an embedded diagnostic processor. Basic preventive maintenance is performed by the user, and remedial maintenance performance by Gould service representatives is enhanced by remote diagnostic groundwork performed at the time the service call is placed.

  - Software Support offerings include the Software Update Service for keeping abreast of program revisions and documentation updates; the Software Communications Memo provides users with information of new product releases; Onsite Analyst Support is also available at hourly rates.

  - Comprehensive Sub-assembly Exchange is available for users involved in self-maintenance. Priority access to parts inventories and back-up support is offered as well as Comprehensive Configuration Management to CSE customers.

- Configuration Management consists of a sampling of many programs designed to provide users with information needed to keep their systems current. Notification of Engineering Changes affecting form, fit, or function of Gould equipment as well as supplying notice of modifications to outside vendor peripherals (offered as standard CSD products) are provided through the service. Other programs can be added which offer information on new software releases, updates to diagnostic software and technical documentation, and technical support briefs that supply problem/solution tips commonly encountered in system support. The Comprehensive Configuration Management offering bundles all of these programs and adds a number of Gould-performed system tracking and reviewing services tailored to the customer's needs.

- Gould Customer Training is available for technically experienced as well as novice users. Courses utilize training methods emphasizing hands-on lab sessions, and class sizes are limited to facilitate trainee/instructor interaction. Courses are conducted at Gould Training Centers in Fort Lauderdale, Washington, D.C., and Los Angeles, and can be arranged for on the customer site.

SERVICE DIRECTIONS

- Recognizing increasing demands for high-quality service as well as market pressure to maintain low maintenance rates, Gould sees the key to future service profitability lying in optimizing its labor force and increasing productivity through product reliability and maintainability. An emphasis on remote diagnostics in current applications and in future product development will play a major part in Gould's future service strategies.

- In addition to the reorganization associated with the Imaging and Graphics support resource consolidation, CSD plans to centralize service reporting for the divisions in the near future. All call management will be handled and processed through the Fort Lauderdale Customer Service center.

- The combination of the two service groups' skills and manpower, as well as this centralization of call reporting, provides Gould with support capabilities more closely aligned with the requirements of the commercial market. Supplying customers with a single point of contact for service of the two divisions' machines and the ability to interface with field representatives responsible for a wider variety of products will provide demanding commercial users with a more coordinated service delivery.

- In Gould's new direction toward the commercial marketplace, flexibility in service offerings and in policy toward mixed-vendor systems will become increasingly important. Gould, over the past few years, has adapted to user needs in the unbundling of support options and in responding to user self-maintenance trends. Increased activity in the commercial marketplace may also place more pressure on Gould to provide broader systems service in terms of third-party support provision.

SERVICE VENDOR PROFILE

HEWLETT-PACKARD COMPANY
3000 Hanover Street
Palo Alto, CA 94304

President and CEO: John A. Young
GM Customer Support: Michael Leavell
Computer Sales, Fiscal Year 1985:
$4.5 Billion

BACKGROUND

- Fiscal 1985 proved a trying time for Hewlett-Packard Corporation, as for the first time in the past 10 years annual profits took a sharp downturn. Pay cuts ranging from 5% for sales and service employes to 10% in top management as well as monthly scheduled mandatory days off were instituted across the board. Early retirement plans and voluntary severance incentives were introduced in HP divisions out of balance with the company's workforce. Then, in January 1986, a $35 million suit against HP was filed by Datagate, Inc. of Milpitas (CA), charging HP with unfair competitive practices against third-party maintainers.

- Despite the range of setbacks seen over the year, HP managed a modest 8% growth in net revenues company-wide, and a 5% growth in systems, peripherals, and network products. Internal programs aimed at regaining revenue losses through increased productivity, especially in inventory control, contributed to the bottom line. And, despite retirement plans and restricted hiring practices imposed in 1985, HP's workforce increased by approximately 2,000 worldwide, bringing total employment numbers to 56,000 in the U.S.

- Integration of HP's Information Systems and Personal Computer Groups combined responsibilities in 1986 for all data processing systems from Portables through 3000 Series. The newly formed Information Systems Sector, in line with President John Young's reformation of HP's traditionally autonomous product divisions, will serve to focus HP's efforts to provide a more coordinated and compatible computer product line.

- Since Young's takeover as CEO in 1978, HP has been undergoing various phases of the reorganization effort aimed at unifying and directing its product development toward RISC (Reduced Instruction Set Computer)-based technology. The first of the line of RISComputing products, known as the Spectrum program, were introduced in 1986, after years of redirection and development.

  - HP 3000 Series 930 and 950 with RISC efficiencies can outperform competing minicomputers for about half the price of IBM and DEC equivalent models.

  - Boosting HP's high end, the Model 840 puts HP in direct competition with DEC's low-end VAX in the engineering market, at prices also significantly lower.

- Other new releases within the past year include the Vectra supermicro with performance levels above IBM's PC-AT, an enhanced laptop Portable Plus at reduced prices, and a variety of enhancements to the AdvanceNet LAN system.

- Over 250 new software packages were introduced over the past year, reflecting a primary corporate goal to improve software quality and standards for the industry set in 1985. Influenced by this emphasis on software, HP recruiters throughout 1985 hired more computer science than electrical engineers for the first time in HP's history.

SERVICE DEMOGRAPHICS

- HP maintains nearly 100 sales and support offices across the U.S. Two centralized support locations in Santa Clara (CA) and Atlanta (GA) field incoming customer calls and house back-up expertise for both hardware and software field support staff. A global network links HP service offices, allowing staff at all centers to draw on a common data base for problem diagnosis and resolution assistance.

- HP computer-related service revenues topped the billion dollar mark last year (see Exhibit IV-F-1), with $1.56 billion reportedly accrued from support activities in 1985. These revenues from service for equipment, systems, and peripherals (excluding medical electronics and analytical instrumentation) represent approximately 25% of the net revenue figures reported for computer product sales. The recent organizational consolidation of the Information Systems and PC groups with the formation of the Information Systems Sector is reflected in HP's new accounting practices, and newly adopted revenue groupings are not incorporated in exhibited figures and growth rates prior to 1984.

SERVICE DELIVERY

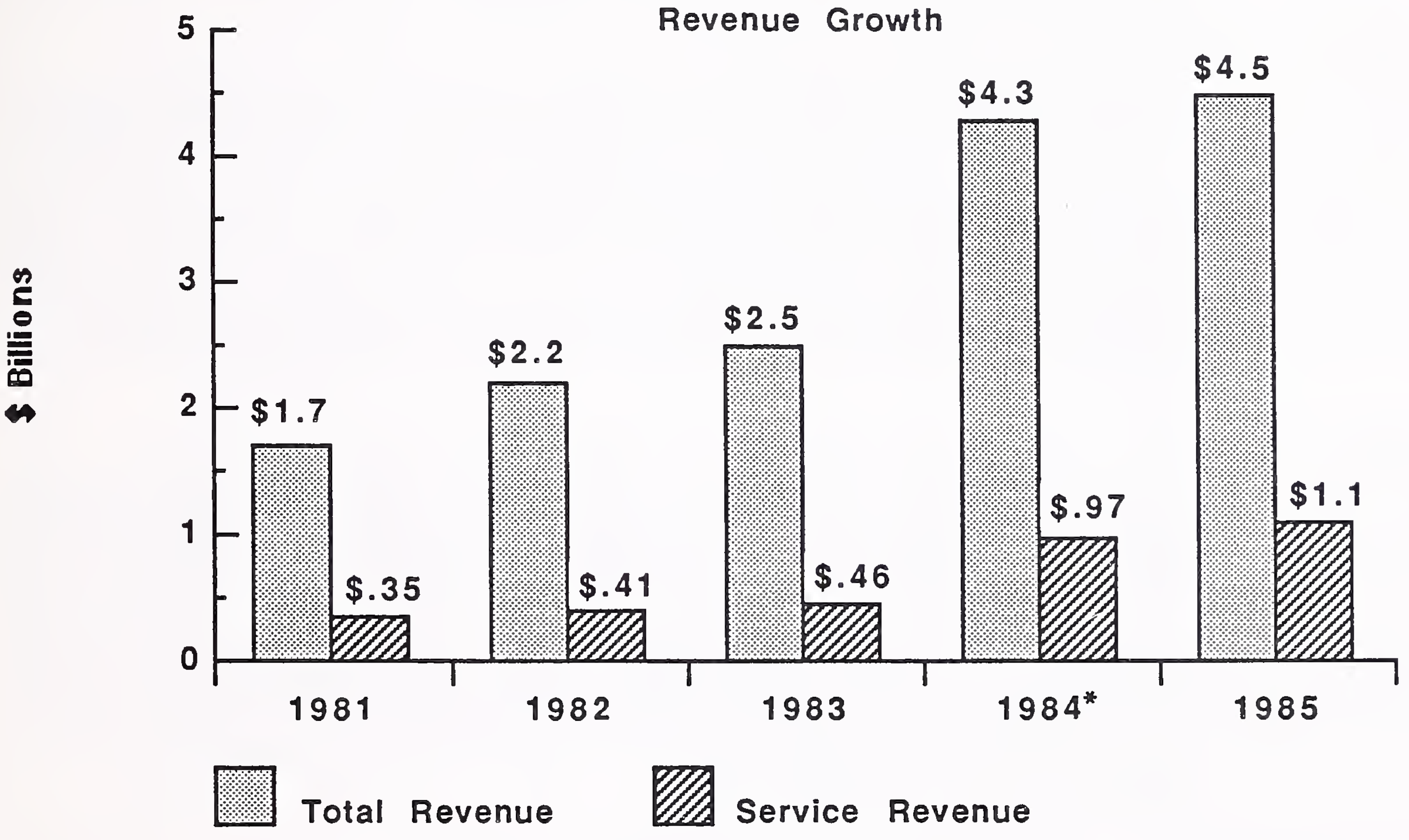
- HP provides users with an array of support options through both coordinated support packages and unbundled service offerings. Each step of what HP views as the "application life cycle" is served by HP programs, from planning and evaluation stages through phases of ongoing support.

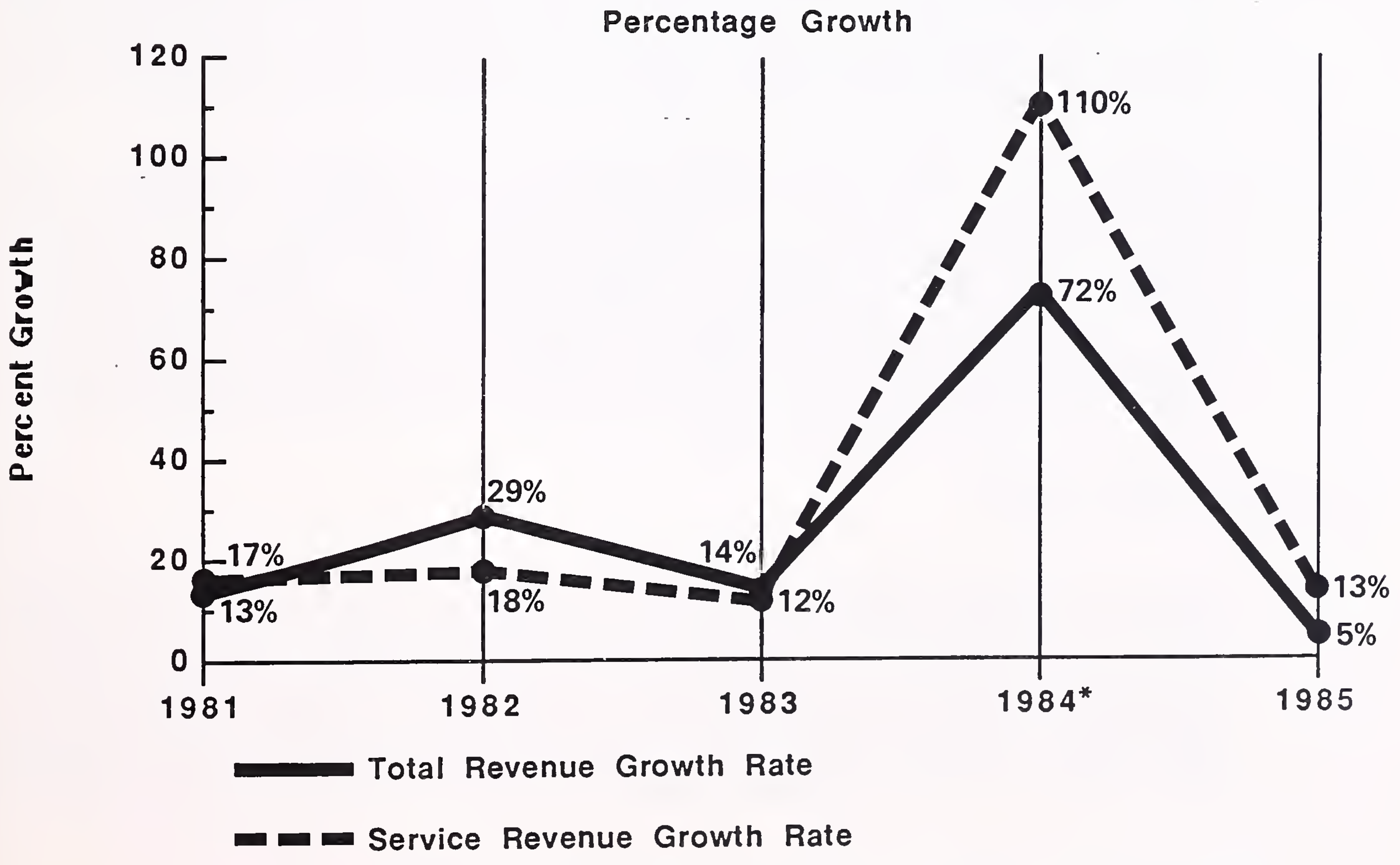
  - HP offers consulting and planning help to customers in initial evaluation phases, including needs analysis and requirements definition, system and support specification, cost of ownership analysis, as well as authorization and financial services.

  - As the system order is filled, HP assists the client in implementation planning and preparation of the system site. Extensive educational support is offered in both system application (programming, analysis,

EXHIBIT IV-F-1

HEWLETT-PACKARD COMPANY'S REVENUE AND PERCENTAGE GROWTH





*Note: 1983-1984 growth rate is artificially high due to change in accounting procedures.

and system management courses) and operation subjects (including user as well as control and technical training). HP representatives work with site personnel to develop an appropriate training plan customized to the specific system application and environment.

  - When the system arrives, HP provides complete delivery, installation, and testing services. To asure efficient integration of the new system, clients can enlist the help of HP Application Project Consultants. Through an Application Project Center, the customer works with HP to create a Custom Implementation Plan designed to meet specific software, training, and support needs. HP-ASSIST services help customers' staff and system operators adjust to the new system and provide an integrated, systematic approach to operational implementation.

  - Once the system is incorporated into the customer's environment, various maintenance support offerings are provided to keep the system productive. Software support provision ranges from maintenance on a time and material basis to full Account Management support (featuring on-site assistance, complete and ongoing documentation support, status bulletins and software updates, and telephone Response Center access, all coordinated by an assigned HP representative). All aspects of the Account Management plan can be purchased separately or bundled as needed in Custom Support plans.

- HP hardware maintenance services are packaged as Standard System Maintenance (providing 5-day/12-hour through 7-day/24-hour on-site coverage with 4-hour response guaranteed) and Basic System Maintenance (an economical alternative offering 5-day/8-hour on-site availability and next day response). Cooperative Support services furnish cost savings options for clients with large installations and technical expertise.

- Hardware Subscription Services supply current service information for products under self-maintenance plans and provide notification of procedural and engineering changes, documentation updates and revisions, and current schedules for HP maintenance training programs. Phone-in hardware consulting, per-incident hourly support on-site, and component-level assembly exchange services are also offered in addition to HP's standard program features, and elements of all can be bundled into a support package suited to a customer's specific hardware needs.

SERVICE DIRECTIONS

- As HP continues release of its RISC-based Spectrum line, support of the new and technologically different line will increasingly produce change within HP's Field Service operations. Logistics and inventory operations will be impacted as new product component types are incorporated into stocking and distribution systems. Staff expertise and field experience with RISC technology will take time to acquire, and simplification in design inherent in RISC units will cause shifts in current balances between hardware and sofatware maintenance. This shift in emphasis will initially intensify on the software side, especially as users strive to incorporate existing 3000 System components and software with newly installed Spectrum systems.

- The use of remote methods of support, with Spectrum's strength in communications and connective capabilities, can be expected to increase and will most likely follow the path of "Predictive Support" newly introduced for the HP 3000 Series. Software developed for the program, when run on a regular basis, generates a regular report tracking potential system problems. The customer can feed this information directly to an HP Response Center, where an engineer can determine the proper maintenance measures to help the user prevent the predicted problem. The Predictive Support program became part of HP's standard hardware support service for the 3000 Series with its introduction in 1985.

- A Capacity Planning Program, which assists customers in the balancing and regulation of system usage, also became available in 1985. This HP 3000 service automatically monitors use of system components over time and transmits the data to a Response Center for analysis. A report is generated providing information that can be used to shift capacity between multiple 3000s or across times of day, allowing the user to balance workload and use computing resources more efficiently. With the increased processing speeds and abilities of the new Spectrum line, internal support reporting services such as these will undoubtedly become an integral part of the Spectrum service provision.

- The impending outcome of Datagate's litigation against HP regarding HP's alleged monopolization of service on its machines will be significant to HP's service operation as well as to the TPM industry as a whole. This and other suits charging hardware vendors with unfair competitive practices will serve to shape the future of the TPM marketplace, whether court decisions favor manufacturer or independent support causes. Datagate's allegations of HP's alleged unfair parts supplying practices and record of disparaging remarks regarding third-party abilities to properly service HP equipment may cost HP up to $45 million in punitive and compensatory damages, in addition to imposed "policy" changes that may cost service market share. With a current 90% share of its service market (according to Datagate estimates) and the broad menu of comprehensive coverages offered to users, HP Customer Service stands in a relatively comfortable competitive position, regardless of possible legal outcome.

SERVICE VENDOR PROFILE

PRIME COMPUTER INCORPORATED
Prime Park
Natick, MA 01760

President: Joe M. Henson
Vice President, Manufacturing and Service: John T. Maske
Revenues, Fiscal Year 1985: $769 Million

BACKGROUND

- Prime Computer, Inc., although relatively small next to rivals such as Data General, Digital Equipment Corporation, and Hewlett-Packard Company continues to gain marketshare and momentum in the minicomputer marketplace. Despite industry-wide slumps in revenue growth, Prime increased its workforce by 800 worldwide in 1985 and has accelerated its rate of reinvestment in research and development and expansion of distribution channels in efforts to achieve its goal of emerging as a $2 billion company by 1990.

- Prime revenues have increased well over twofold over the past five years, topping $769 million in 1985 (see Exhibit IV-G-1) from a modest $268 million accrued in 1980. Focusing efforts on high growth markets of commercial data processing and engineering/scientific industries, Prime targets use of its limited resource base at specific vertical markets rather than joining existing competition in more popular office automation markets. Computer-Assisted Design and Manufacturing (CAD/CAM) sales increased by 33% from 1984 and continue to be a major revenue producer for Prime, contributing 18% of the total 1985 figure.

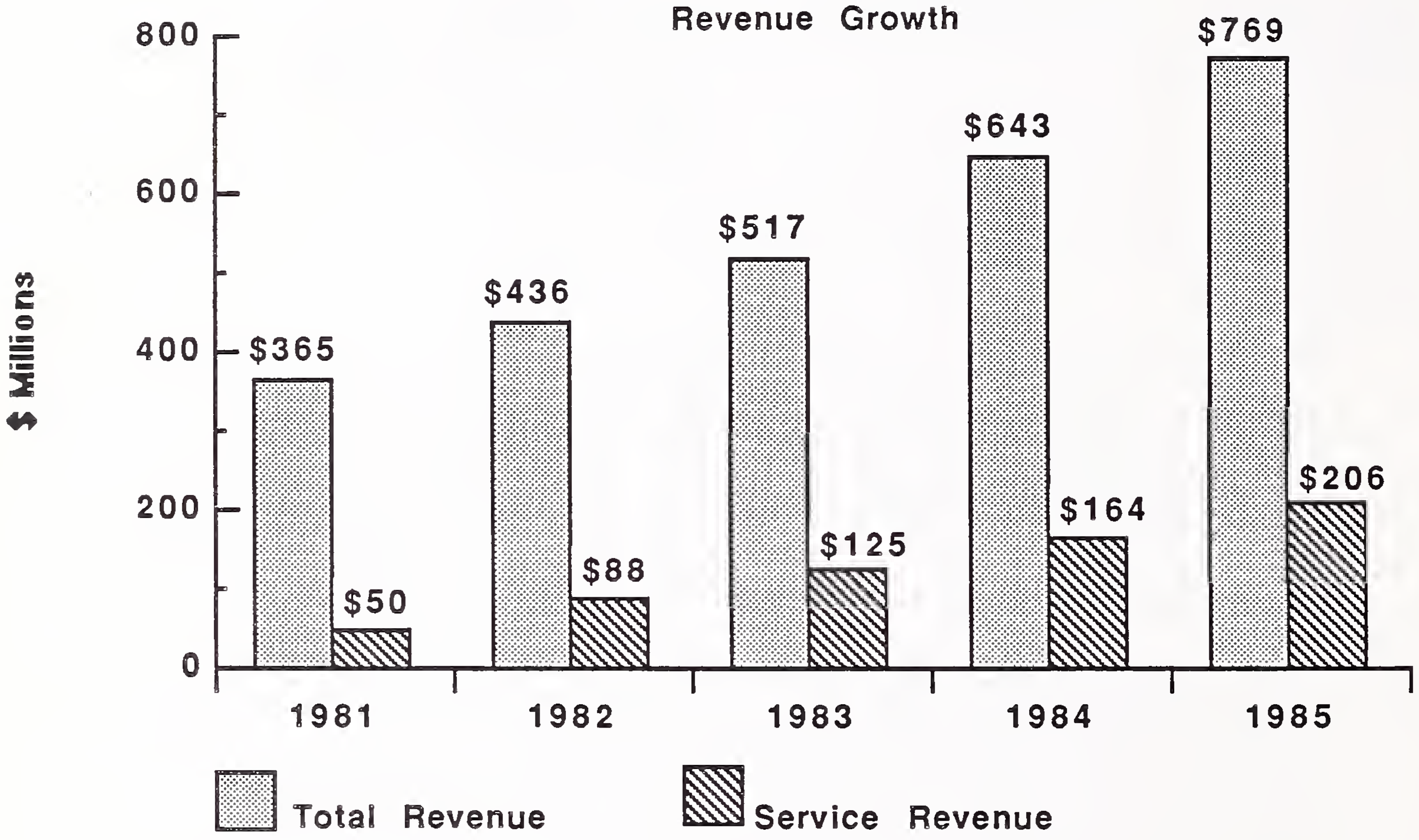
- New products for the commercial market enhanced Prime's high-end offerings with the 9955 II and 9755 superminicomputer releases, providing 25-50% performance boosts over previous members of the 50 Series. Two mid-sized additions were also announced in the series, with upgrades to the successful 2650 (the new 2655) and 9650 (the 9655). Prime's edition of the popular UNIX multitasking operating system, PRIMIX, also became available in mid-1985. Although avoiding the IBM-entrenched low end of the line in new product releases, Prime added IBM compatibility to their 50 Series in early 1986 in the form of a PC system module option and a PC-to-host software link, improving system user productivity and adding access ability to IBM-compatible software to the series.

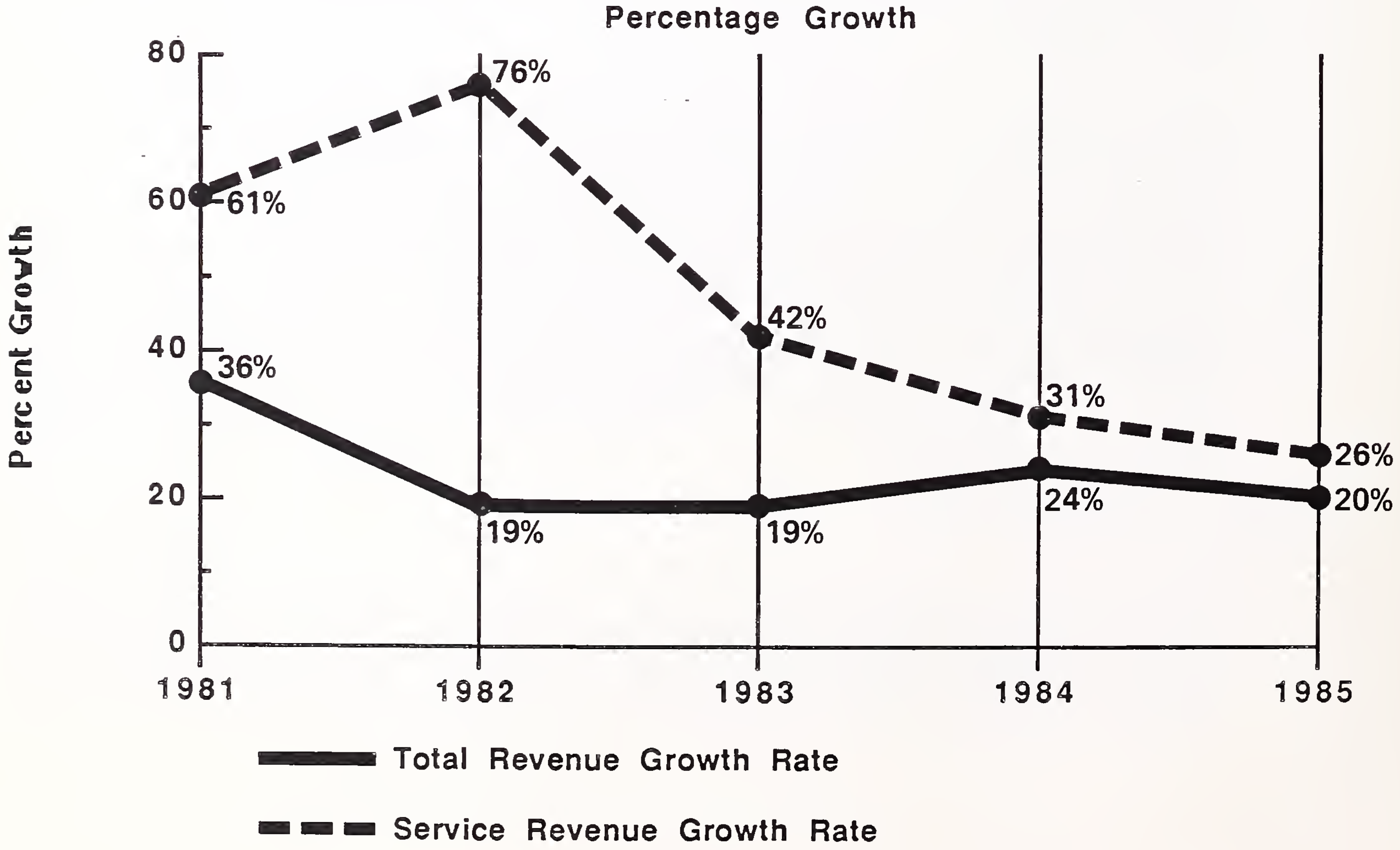
SERVICE DEMOGRAPHICS

- Prime provides support in the field through its workforce of 588 field engineers. The company bases its service operations in Natick (MA), where all calls are fielded through the centralized Customer Support location. Prime Customer Service utilizes its ALERT and ESCALATION procedures ensuring

EXHIBIT IV-G-1

PRIME COMPUTER INC.'S REVENUE AND PERCENTAGE GROWTH





prompt response from field support, typically providing an initial telephone response within 30 minutes of a request.

- Alerts will be raised and Prime management notified when system down situations exist and problems have not been isolated by the local FE within two hours of arrival on-site. Assistance will be requested from the Regional Support Center to assure problem resolution is in process within the guaranteed response time plus two hours. When six hours of hands-on time have elapsed, the Regional Technical Specialists notify Prime's central support location in Natick, and Prime's Customer Service Problem Management group will intercept responsibility for expeditious resolution or, where required, "identified hardware replacement."

SERVICE DELIVERY

- Viewing itself as a "total solutions supplier," Prime offers support from systems planning stages through ongoing service and user training.
  - Pre-installation support includes site and environmental planning tailored to meet individual customer needs. Installation, inspection, and testing of the final configuration is arranged via Prime's 800 number upon components' delivery to the site, and a service representative can be immediately dispatched to the facility to prepare the system.
  - System maintenance support options begin with Basic Service, including on-site coverage 8:00 a.m. to 5:00 p.m. Monday through Friday, automatic installation of field change orders, and scheduled preventive maintenance calls. Prime's Preferred Service option enhances Basic Service with two extra hours of on-site availability daily and guaranteed response times of two hours or less (within 100 miles of a designated Metropolitan Service center).
  - Response commitments are backed by a refund plan allowing for 5% credit on monthly fees should response not meet guaranteed times. Preferred Service customers interface with an assigned account coordinator and receive toll-free access to Prime's customer Support Center and on-line error reporting electronic mail system, POLERS. Systems utilizing PRIMOS operating software also receive software support udner the two contract options.
  - The High Availability Option (HAO) is available to high-end users who do not incorporate non-Prime units in the system. HAO provides 24-hour/7-day on-site coverage and 99% core system uptime guarantees (backed by a full month's refund in the event of any failure to meet requirements).
- Discounts from monthly maintenance fees are provided to contract clients for co-located systems and annual prepayment of support charges.

- Prime's Standard Software Support plan includes updates and installation assistance for new releases, hotline support eight hours daily, with on-site support during those hours, and documentation and materials updates. More recently, Prime has made a quarterly "Customer Technical Bulletin" a part of software support, delivering update and technical information and news to users at no additional charge.

SERVICE DIRECTIONS

- Prime's recognition and support of an "open system" networking philosophy has forced at least a limited concession to third-party maintenance. With a majority of Prime system components being provided by outside manufacturers, Prime has necessarily supported such OEM partners as CDC and Convergent Technologies. Expected extensions of Prime's policy of "coexistence with the competition" will involve increased acceptance of mixed-vendor systems support.

- Prime expects continued expansion of its worldwide service organization in efforts to ensure capability to provide customer support commensurate with expected sales. Currently, one-quarter of Prime's total employee base, as well as one-quarter of its capital spending, is dedicated to customer support.

COMPANY VENDOR PROFILE

STRATUS COMPUTER, INC.
55 Fairbanks Boulevard
Marlboro, MA 01752

President: William Foster
Vice President, Customer Services:
R. James Schroeder
Revenues, Fiscal Year 1985:
$80.1 Million

BACKGROUND

- Stratus Computer, founded in 1980, is a company relatively new to the small systems market, and with its focus on fault-tolerant systems, provides an interesting contrast in support provision to competing vendors discussed in this report.

- The high system reliability requirements of Stratus' users, relying on instant and uninterrupted transaction analysis, require the use of redundant processors and self-run error detection and diagnostic software. The hardware on each board runs continuous self-checks after each machine cycle, and should a component fail, the board is automatically removed from service before erroneous processing occurs. The processing cycle continues uninterrupted as the identical back-up board resumes the faulty unit's operation.

- Supplying these high-reliability units to interactive users in banking, computer-integrated manufacturing, health care, and government, Stratus has heavily concentrated efforts in these markets since its first shipment in 1982. Although still a low revenue company compared to listed competitors in the small systems market, revenue growth for Stratus has been very high since those initial shipments left the plant (see Exhibit IV-H-1).

- The fault-tolerant systems produced by Stratus include:

  - FT 200. Introduced in 1981 and first shipped in 1982, the FT 200 can support up to 64 workstations per processor with a main memory of up to 8 MB and a performance of 0.75 MIPS.

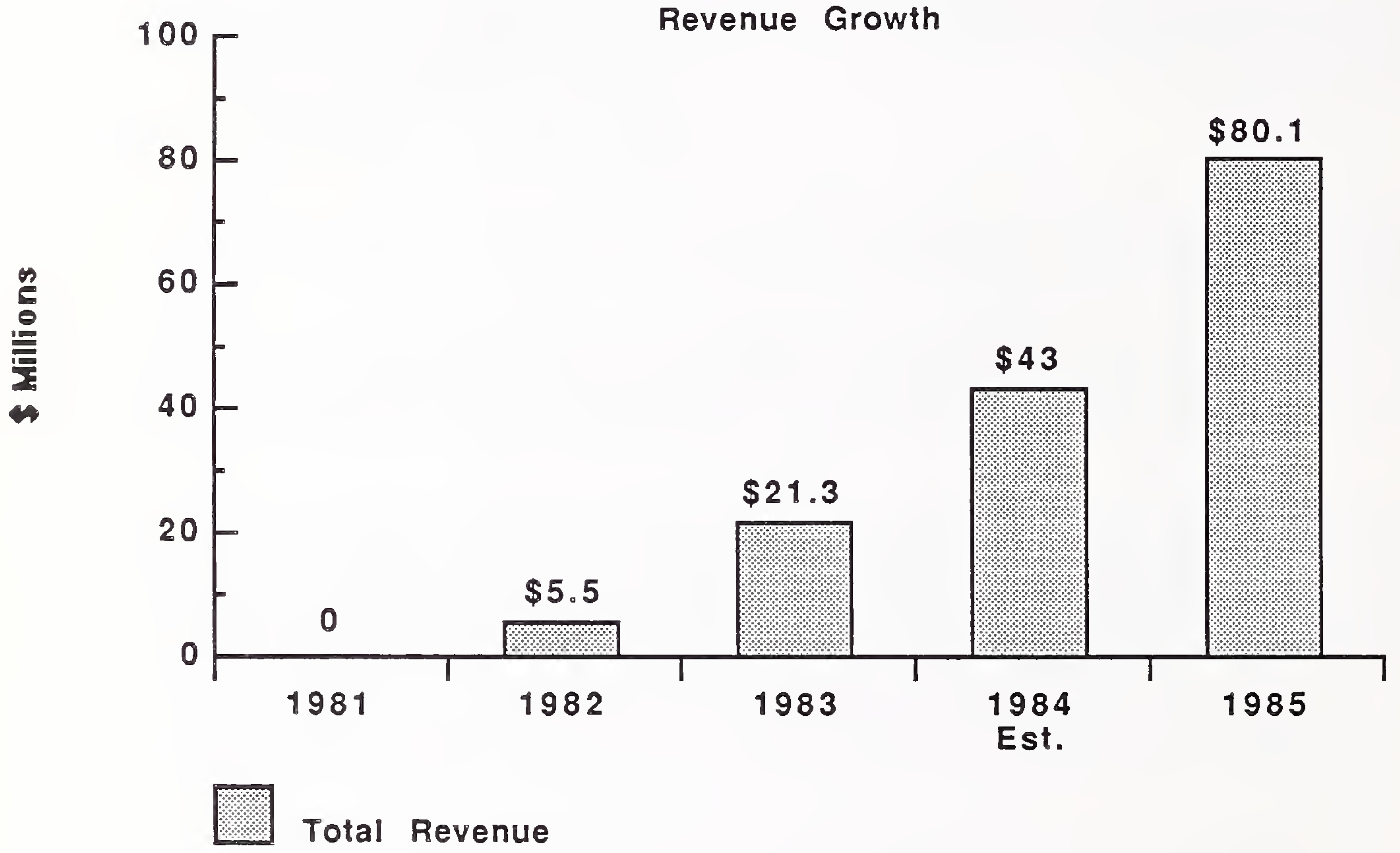
  - FT 250. The company's most recent low-end machine, the 250 was introduced in April 1985 and has 4 MB of main memory. The system is priced at $115,000.

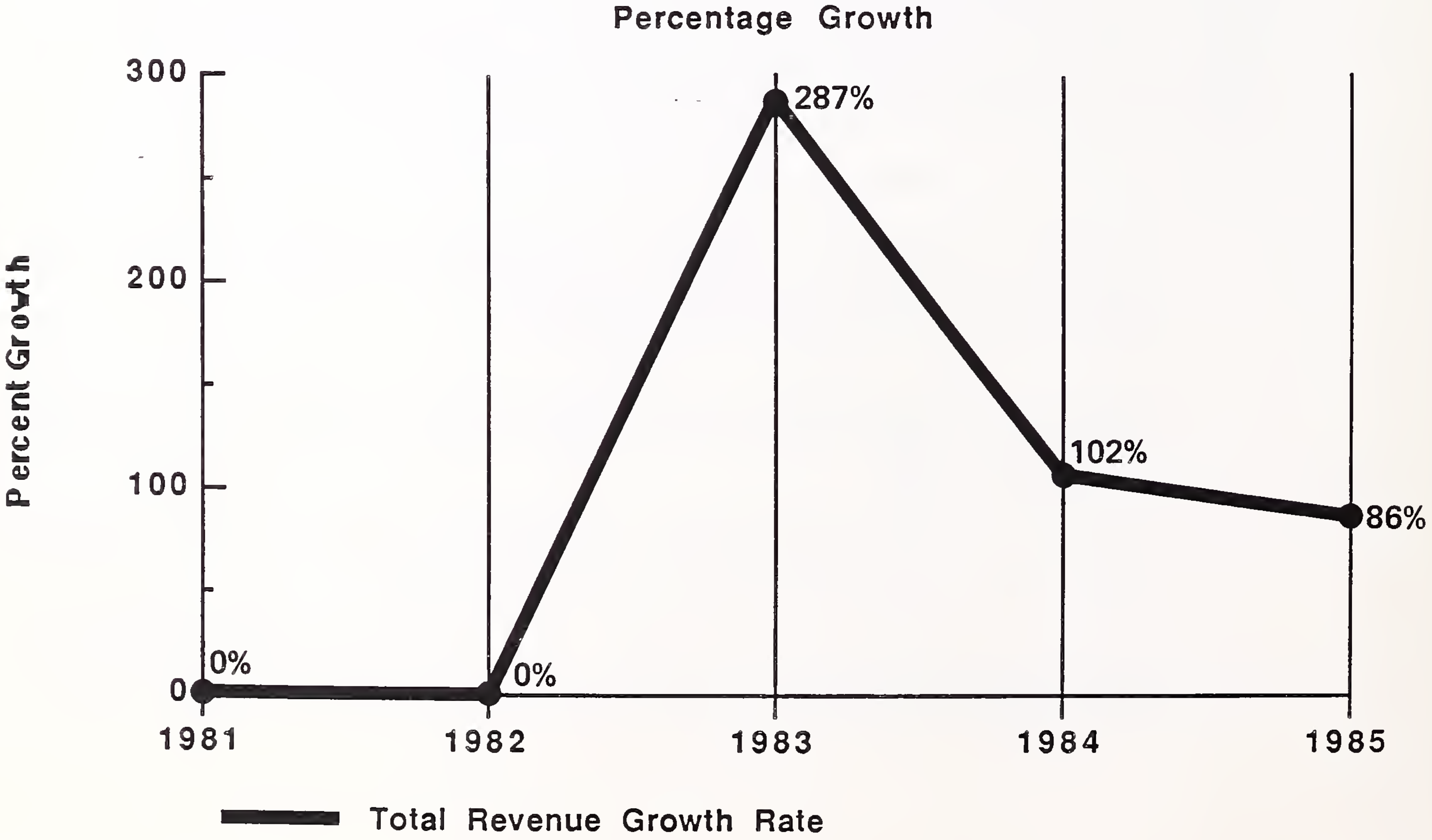
  - XA 400. A mid-range processor available with up to 8 MB of main memory and capable of supporting up to 128 users.

  - XA 600. The high end of the Stratus line, the 600 can support 256 users per processor, 44 billion bytes of storage, and 16 MB of main memory. The XA 600 has a performance rating of 3 MIPS.

EXHIBIT IV-H-1

STRATUS COMPUTER, INC.'S REVENUE AND PERCENTAGE GROWTH





SERVICE DEMOGRAPHICS

- Stratus' customer support centers, even in consideration of the company's comparative size, employ a very small engineering staff, with a total of 45 members. The various remote support capabilities as well as the redundant systems' reduced need for immediate field dispatching availability allow Stratus to support users effectively while keeping support staff numbers relatively low. Most software problems can be handled from the Customer Assistance Centers (CACs), and remote assistance in conjunction with user involvement reduces the need for unscheduled hardware engineer visits to user sites.

- Two Customer Assistance Centers currently provide support to all domestic Stratus users and link each other and all user sites via a dial-up data network, the Remote Support Network. These two support centers (located at the Marlboro manufacturing location and in Phoenix, Arizona) house Stratus' 25 software and 20 hardware engineers.

- Revenues accrued from service activities are reported by Stratus at $6 million in 1985; 80% of this revenue was derived from hardware service and 18% from software support provision (the remaining amount was brought in through training revenues). The newness of Stratus units in the field has precluded tracking service revenues much before 1985, with most units still under warranty terms. Support on those units contribute little to corporate income.

SERVICE DELIVERY

- Stratus' approach to hardware maintenance is unique among the small systems vendors discussed in this report due to the reliability technology employed in their units. All failures are monitored and detected by the system, and the user is notified of the exact location of the failure (through red light on failed console and individual board at fault and by error messages on system terminal) while the Stratus system logs a service call via dedicated modem directly to the CAC without user intervention or any degradation in processing.

- CAC personnel, upon securing permission from the user site, run diagnosis remotely on the failed component and confirm the unit problem. If the failure is at circuit board level, the part can ship by overnight courier and be replaced by user personnel. Other, higher-level problems are handled on-site by Stratus FEs, fully prepared for the task by remote briefing and communication with the user via electronic mail interception.

- All problems and concurrent action taken by Stratus staff are recorded and filed for access in Stratus' Call Management data base.

- Relying on the remote technologies applied in Stratus' support as well as user serviceability built into the units, maintenance costs for Stratus' contract options remain relatively low. Three agreements are offered to Stratus customers:

- At 3.5% of list price, self-maintaining users are provided with parts and assistance from the CAC when needed.

- The second option, at 6.5% of list, is the Co-Active Maintenance agreement, leaving routing and low-level replacement to user operators, but providing full Stratus support for the more complex units (tapes, printers, power supplies, etc.). Approximately 90% of all Stratus customers opt for Co-Active Maintenance.

- Traditional on-site maintenance contracts are also available to users at 10.5% of system list price.

SERVICE DIRECTIONS

- Stratus and other fault-tolerant systems manufacturers are in a unique service position, as the nature of the systems allows the vendor to optimize service resources through centralized remote support and a more proactive user base. With reduced field engineering needs, there is little potential for Stratus and like manufacturers to enter into third-party maintenance. Obviously, a hardware FE staff of 20 nationwide is not sufficient to competitively support a host of other vendors' equipment at Stratus user sites.

- The efficiency of remote support and parallel system reliability affords Stratus low service costs and little need for direct user contact. To continue to foster good relationships with users, Stratus will undoubtedly continue to utilize service resources to develop and employ non-hardware maintenance support services such as training and consulting. Heightening Stratus' visibility to users, such services can provide customers with a feeling of ongoing user/vendor interaction and serve to increase overall user satisfaction.

- With large, established firms (such as DEC with their newly released VAX 8800 parallel processor) entering the arena, Stratus will find its marketplace becoming increasingly competitive in the next few years. Stratus' future success is heavily dependent on its continued OEM relationship with IBM, with 15% of Stratus' sales derived from the two firms' agreement. Relationships with OEMs may become increasingly important to Stratus' survival in the fault-tolerant market.

SERVICE VENDOR PROFILE

WANG LABORATORIES
One Industrial Avenue
Lowell, MA 01851

President and COO: Dr. An Wang
Vice President, Customer Services:
Raymond C. Cullen
Revenues, Fiscal Year 1985:
$2.35 Billion

BACKGROUND

- Wang's aggressive business plan set for 1985 was foiled by unexpected industry downturns and an adverse economic climate felt by nearly all systems competitors last year. Earnings fell far short of projections, and the company was forced to reduce expenses throughout the year. "Voluntary separation" and early retirement incentives were employed in a significant staff reduction of 1,500 workers, and major organizational consolidations were imposed, reassigning management personnel to needed revenue-producing positions in the field. Exhibit IV-1-1 evidences Wang's financial downturn seen in 1985.

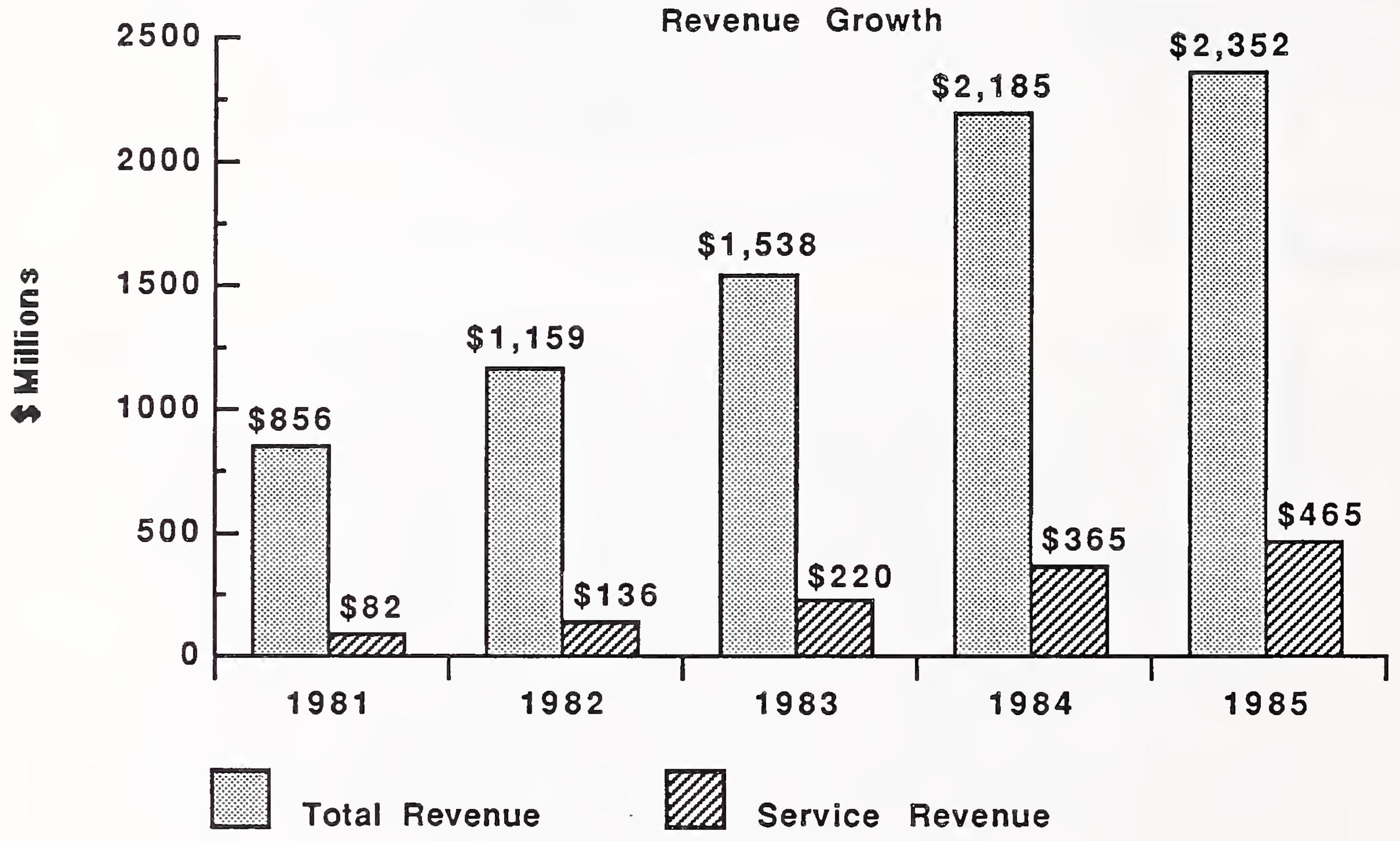
- The departure of President John Cunningham placed Dr. Wang back at the helm in July 1985, and as revenues plunged into the red in Wang's second quarter, "the doctor" took a more active role in day-to-day management. His pledge to turn Wang's word processing operation into a full-service computer company has brought about changes organizationally as well as strategically. International and domestic sales divisions and six separate sales and marketing organizations were integrated in March in an attempt to focus efforts and trim redundant management positions in the face of major revenue losses. The new unit was to be directed by 11-year Wang veteran J. Carl Masi. Little more than a year after his appointment, however, Dr. Wang announced his intentions to more directly guide Wang's operation toward his $5 billion revenue goal for 1990, and his plan to intervene in the direction of the new department was shortly followed by Masi's resignation.

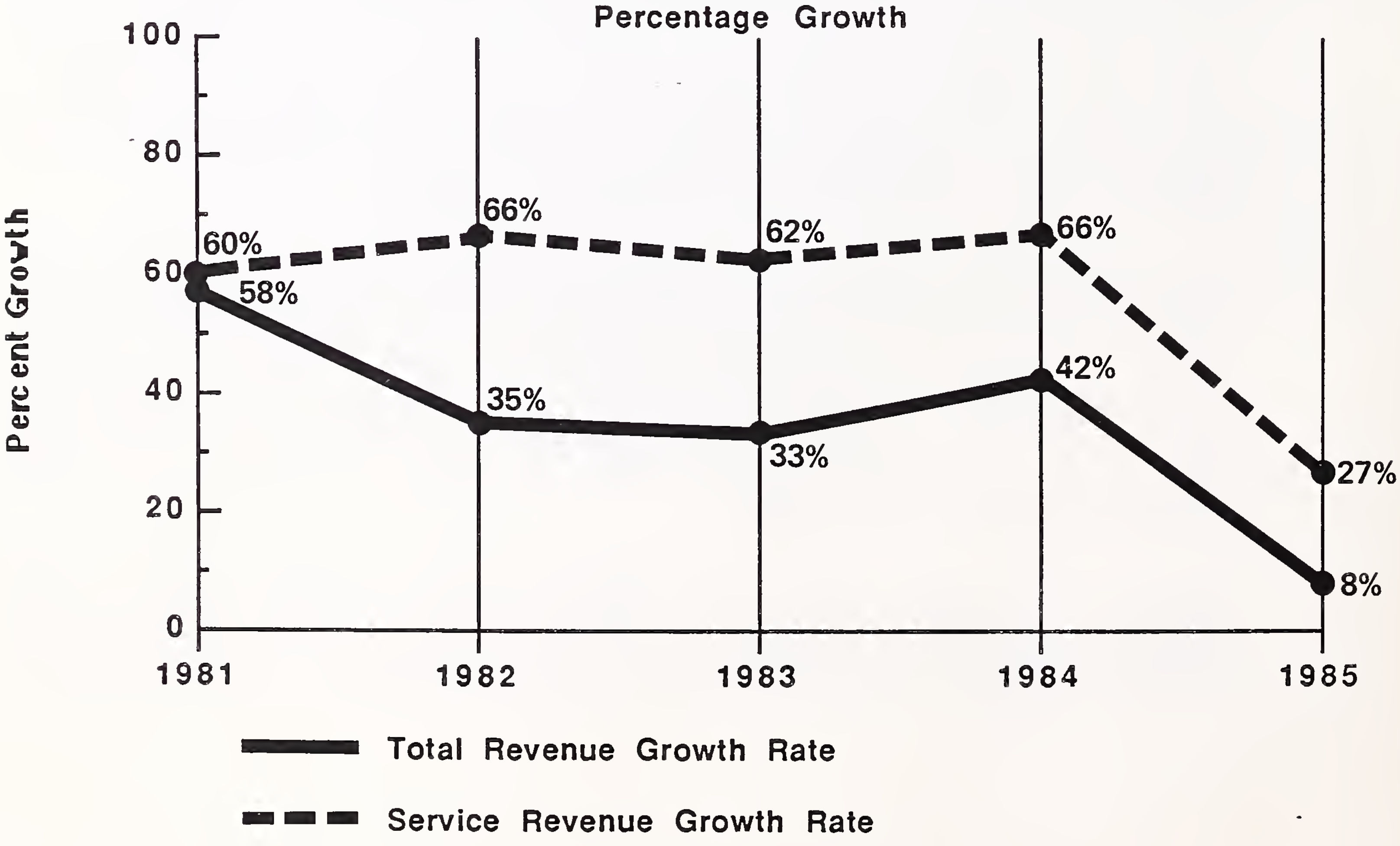
- Efforts to enhance the attractiveness of Wang systems to the broader markets now targeted have resulted in a number of partnership agreements between Wang and companies with expertise outside of the office automation arena. Hartford Integrated Technologies (HITECH) has entered into an agreement with Wang to provide project management software which can be integrated with current Wang systems and office automation software. The total package is to be marketed as The Solution, a product aimed at the MIS applications development market.

- Further involvement with two communications vendors, Telenova and Intecom, also provides Wang with relationships that could help sell its products in the DP/MIS environment. Banking and financial targets will also be more aggressively pursued as relationships with BWK, a banking systems

EXHIBIT IV-I-1

WANG LABORATORIES' REVENUE AND PERCENTAGE GROWTH





software firm, and Texas Commerce Information Systems, a financial systems service supplier, begin to produce marketable results.

- The recent acquisition of Walch, Greenwood Information Systems provides Wang with an operation around which a new subsidiary will be based, Wang Financial Information Service Corporation. Attempts at making inroads into governmental markets were also implied with Wang's 1986 purchase of a share of Custom Software Services, Inc., a supplier of systems to the legal field. Additional agreements in 1985-1986 with a number of third-party suppliers of software and professional services will serve to enhance Wang's attempts to succeed as a full-service computer company.

SERVICE DEMOGRAPHICS

- Corporate-wide reorganization efforts were felt within customer service in efforts to realign support operations with the newly organized sales and marketing departments. Separations between hardware and software factions were removed, and new operational regions were established with the opening of centralized regional support offices in Atlanta, Boston, and Dallas over the past year. Consolidation of technical support, field operations, and support services responsibilities under a single operations director within each region will help to focus and improve Wang's service performance.

- Nearly 400 customer service locations are maintained by Wang worldwide, 283 located within the U.S. The new regional locations coordinate and support local offices' service operations, and field support centers in Atlanta, Lawrence (MA), and Marina Del Rey (CA) perform centralized logistics activities. Wang's U.S. customer engineer workforce totals nearly 3,000, and in efforts to improve performance in the software support area, additional software staff is being added to gear up for performance improvements planned for this year.

SERVICE DELIVERY

- Wang provides a range of service offerings to users, including recently introduced enhanced Uptime 300 performance guarantees, and a newly structured three-tiered software support plan. Wang's current support menu includes:

    - Comprehensive on-site repair services 8 a.m. to 5 p.m., Monday through Friday, providing scheduled preventive maintenance and change order installation. Extended service coverage can be opted for in 9-, 12-, 16-, and 24-hour increments, 5, 6, or 7 days per week. Enhancement to these on-site plans is available to users of VS 15 through 300 machines in the form of added remote diagnostic features.

    - Uptime 300 was introduced to VS 300 users this year, providing on-site and hotline support coverage extended through midnight for core system components, reduced response time quotes, and a 98% money-back uptime guarantee for downtimes exceeding eight hours.

  - The WangCare Guarantee is an established program offering 95% uptime as a standard feature of on-site service to qualifying installations within a 100-mile radius of a Wang support center. Unit replacement is guaranteed if by the second month of a problem, the unit is not performing at the 95% availability pledged.

  - WangCare Plus is an option for On-site Service customers guaranteeing 98% uptimes and two and three hour response times (for sites within 25 and 50 miles of a service center, respectively). The extra services can be purchased at a 25% uplift to regular on-site support charges, and maintenance credits or unit replacements are provided if guarantees are not met.

  - Depot support is also available for less critical applications--both mail-in and carry-in options are offered. A two business day turnaround is quoted, and per-incident mail-in repair can be arranged for customers not interested in contract maintenance.

- New software support contracts were introduced in 1986, and services for software which were previously provided to users at no charge became fee-based. Many customers voiced complaints at the thought of paying for software support that has historically been spotty at best, but Wang justifies the change with talk of improved support and more comprehensive service for their money. The new structure is provided on three levels:

  - Subscription Software Service automatically supplies the user with operating system updates and a monthly publication detailing software revisions and technical changes upcoming.

  - Telephone Hotline Support includes the Subscription Service, phone access to a Wang SE for assistance, and remote links for certain units configured with a Wang PC.

  - Comprehensive Support adds on-site support to these above-mentioned services.

- Additional services provided by Wang include software media replacement (with emergency provisions available) and media conversion for cross-availability within mixed-vendor office systems. Wang educational centers offer a variety of user and technical courses to users in computer-based and self-study formats, as well as through classroom training at 30 Education Centers within the U.S.

SERVICE DIRECTIONS

- In response to Dr. Wang's commitment to penetration into new and increasingly competitive markets, Wang is moving in the direction of flexible support programs and professional service offerings. Exemplifying this trend are Wang's Support Service Packages, bundling a variety of pre- and post-installation services including on-site technical consultation and support, educational services, and conversion and shared-system access programs. Comprehensive professional service plans are also available to assist customers in planning and implementation processes, customized to suit the individual client's needs.

- The reorganizational efforts both within customer service and in other areas of the operation will help Wang to focus and deliver a higher grade of service to users within its new market. The regional reporting structure introduced this year will offer a more cohesive service operation, able to provide the more consistent delivery of support necessary to compete in the broader markets targeted.

SERVICE VENDOR PROFILE

XEROX INFORMATION SYSTEMS
P.O. Box 1600
Stamford, CT 06904

CEO: David T. Kearns
Vice President, National Service:
Peter Sturtevant
Revenues, Information Systems,
Fiscal Year 1984: $1.7 Billion

BACKGROUND

- Xerox, a name synonymous with office copiers for over 25 years, is now aggressively pursuing wider recognition in the office through its Information Systems division. Determined to make its way into the crowded office automation market, Xerox in 1985 adopted a focused strategic plan for business systems penetration known as Xerox Directions. The ability to provide "business solutions" to the marketplace through creating workable systems utilizing various manufacturers' compatible components is the plan's key concept. Xerox's active involvement in the industry-standards coordinating group, the Corporation for Open Systems and the International Standards Organization, is testimony to its dedication to multi-vendor, interoperable product system development.

- Xerox's organizational division of the Systems group and formation of Information Systems combined the planning, development, and manufacture of its data processing products within a more focused functional division. The Information Systems group drives the product strategies of Xerox's microcomputer, office system, word processing, publishing, software development, and artificial intelligence system offerings.

- As a major part of its corporate directions strategy, Xerox Information Systems introduced over the year the first waves of new products embodying the plan. 1985 saw the release of a new generation of workstations, PC enhancements, word processors, and printers as well as an increased emphasis on business software packages. Additions to the lines included:

    - The Xerox Communications XCZZ network, able to link up to 22 IBM-compatible (MS/DOS) microcomputers.

    - Xerox Documenter systems of compact workstations and printers producing high-quality publications by the hands of a single user.

    - Xerox 701s, an entry level electronic publishing terminal system, as well as 50-page per minute 4050 laser printers and high-resolution 4020 ink-jet units.

  - New ViewPoint systems and applications software for the Xerox 6085 Professional Computer and enhanced versions of its XPS publishing software were also released.

  - Expansion of the number of languages available on the 6085 included C, Basic, and Fortran; the hardware previously supported only the proprietary Mesa.

  - Add-on data storage devices for the Xerox 6060 family of PCs were marketed in early 1986.

SERVICE DEMOGRAPHICS

- Complementing Xerox's 1985 consolidation of its previously product-dedicated sales force, Xerox has initiated the integration of its separate service groups over the past year. Planning to offer the business marketplace a 16,000+ member support team capable of maintaining Xerox products as well as third-party machines, the move will bring the Xerox Support Center total to over 280 and provide a service network geared toward the multi-vendor "business solutions" Xerox products provide.

- Service revenues saw proportional increases over 1985, despite the reported gearing-up of support resources for expected increases in sales, as shown in Exhibit IV-J-1 (service revenues expressed reflect INPUT estimates).

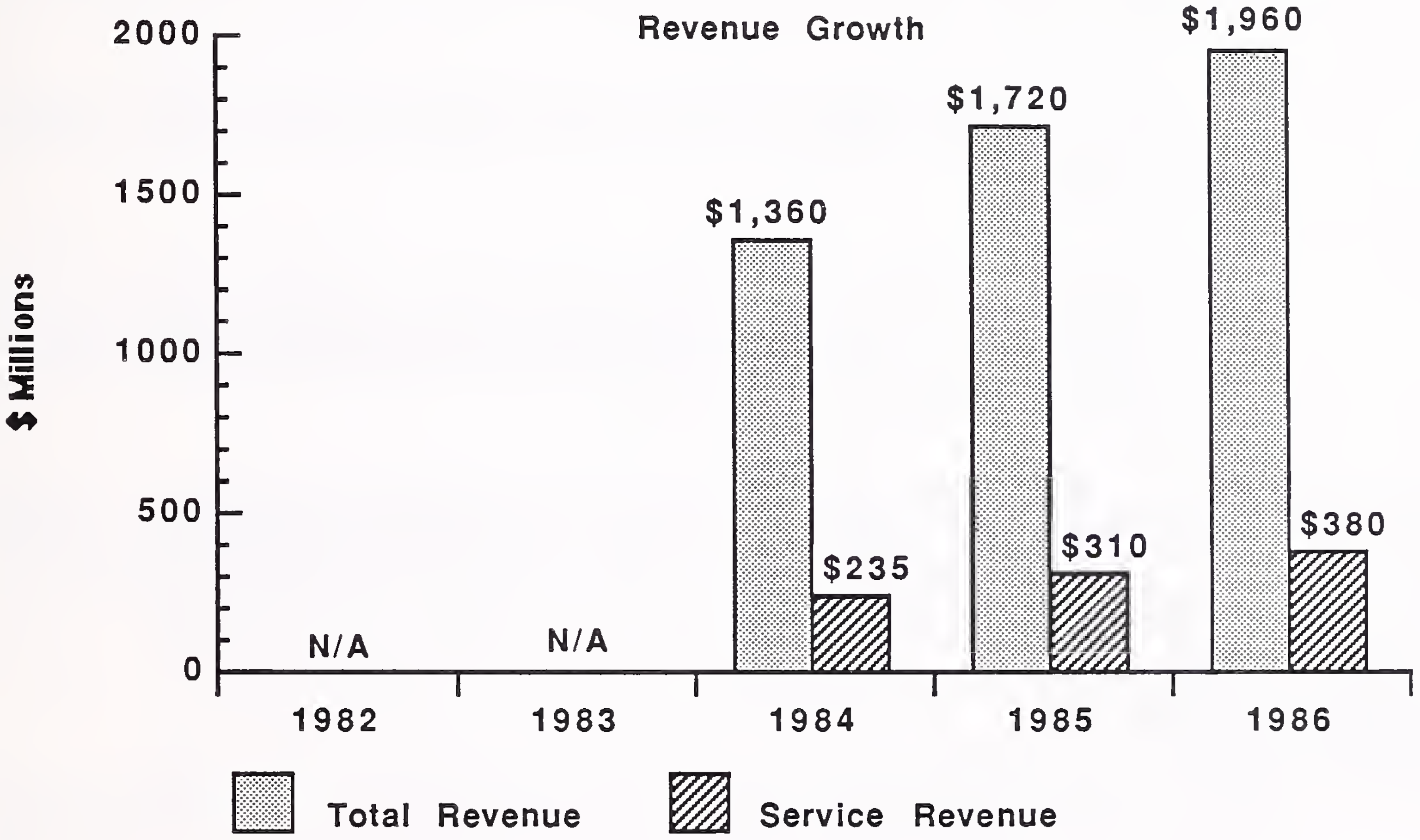
SERVICE DELIVERY

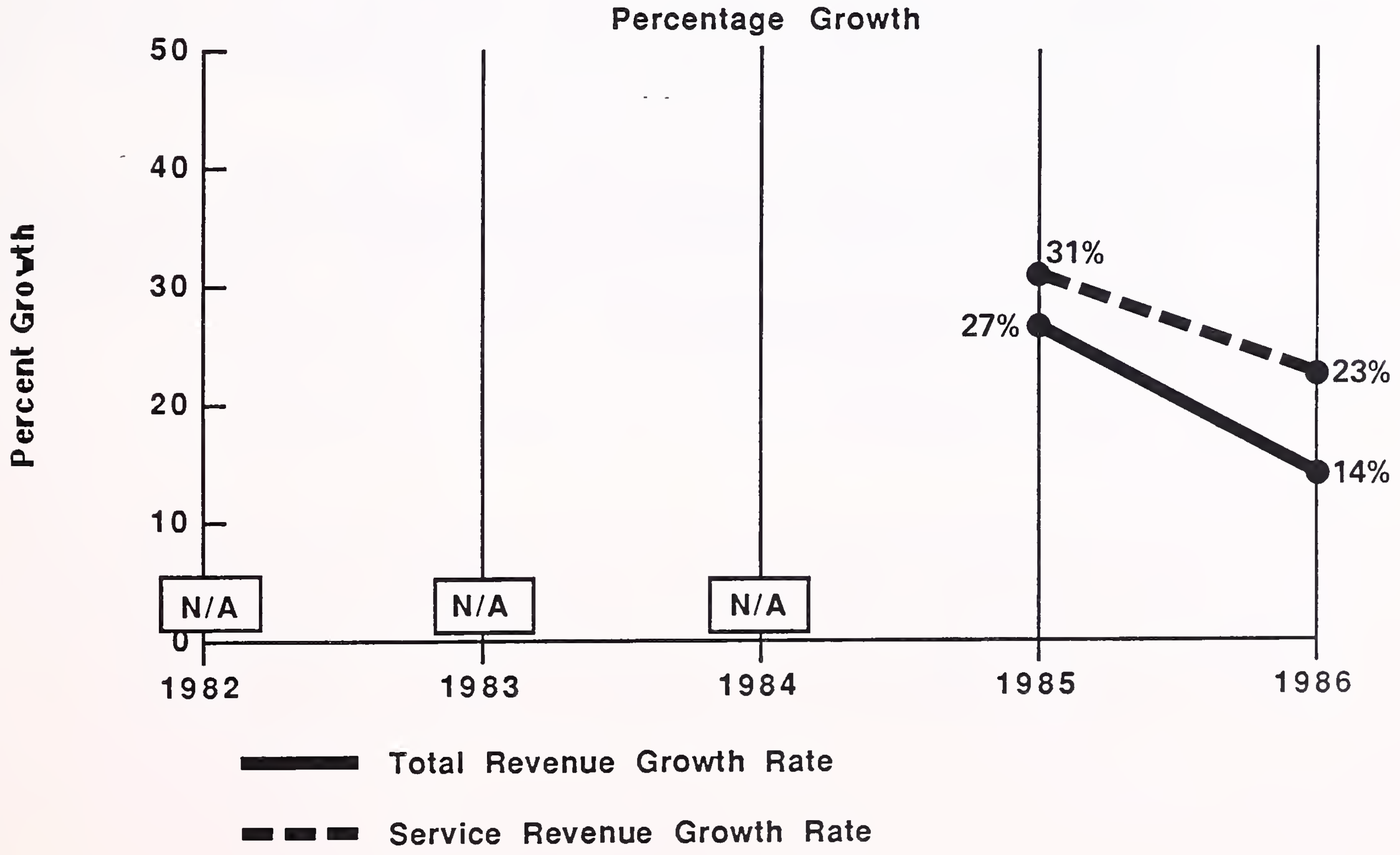
- As a company strategically striving to provide its market with complete "business solutions," Xerox offers customers a hand in the critical initial steps of their system development. Xerox Systems Consulting and Integration (XCSI) can be utilized by customers to involve consultants, experienced with Xerox machines in the office environment, in their own needs assessement and systems planning process. XCSI involves a three- to five-day study of customer needs, existing office system equipment, and system development within the environment, for no charge. If the company finds the XCSI plan acceptable, a contract is then developed around the client's needs in system design, software development, user training, and documentation, creating (or enhancing in-place) office systems to fit the particular business setting. A Complex Proposal Response center can be enlisted to assist with any difficult integrations of new equipment within existing systems, as well as customize hardware and software to needed applications.

- Once a system is in place, Xerox clients can arrange for training through Xerox's Leesburg (VA) facility or at regional and local centers for more common courses. On-site training is provided only as required, usually for large, centralized systems which have been integrated into an existing host computer.

EXHIBIT IV-J-1

XEROX INFORMATION SYSTEMS' REVENUE AND PERCENTAGE GROWTH





- Maintenance contract options available to Xerox users include:

  - Full service, on-site maintenance, eight hours per day, five days per week, with after hours coverage available. Parts, preventive maintenance calls, and revision and retrofit activities are included under the agreement.

  - Xerox Service Center maintenance can be provided as pick-up and delivery, mail-in depot, or carry-in repair, and loaner units can be arranged.

  - Software support is delivered on-site and remotely via toll-free hotlines, and field service representatives are typically trained in both hardware and software problem identification. Xerox's plan to further integrate third-party expertise will mean even more comprehensive support from field representatives.

- Early in 1986, Xerox launched the Service Solutions program for major accounts' networked systems. An initial step toward single-source maintenance of the mixed-vendor office system, Service Solutions, provides for installation and management as well as ongoing maintenance of such networks.

SERVICE DIRECTIONS

- Xerox's further penetration into the office automation market will be best served by a continued dedication to the open-system concept. Without itself providing the extensive processing capabilities available through larger single systems of competitors like DEC and IBM, Xerox must concentrate on coexistence with other vendors to remain a force in the market. New corporate strategy stresses these needs, and connectivity, compatibility, and integration are key concepts in Xerox's future plans.

- The organizational integrations seen under Xerox's new direction will enhance the corporation's ability to uphold its strong reputation for service, even as the systems being served become increasingly complex. Single-source support management capabilities will be key to success in the OA market, known for high demands for coordinated service.

V SMALL SYSTEMS SERVICE MARKET ANALYSIS

A. SERVICE MARKET ANALYSIS, 1986-1991

- As shown in Exhibit V-1, the overall U.S. customer services market, excluding the third-party maintenance market (which will be covered later in this section), is $ 13.6 billion in 1986. This estimate reflects the slowed new product sales growth felt in most segments of the computer industry, particularly in the large systems market. Primary contributors to this slowed growth include:

  - An overall downturn in the computer systems and information services marketplaces starting in 1985 and continuing into 1986.

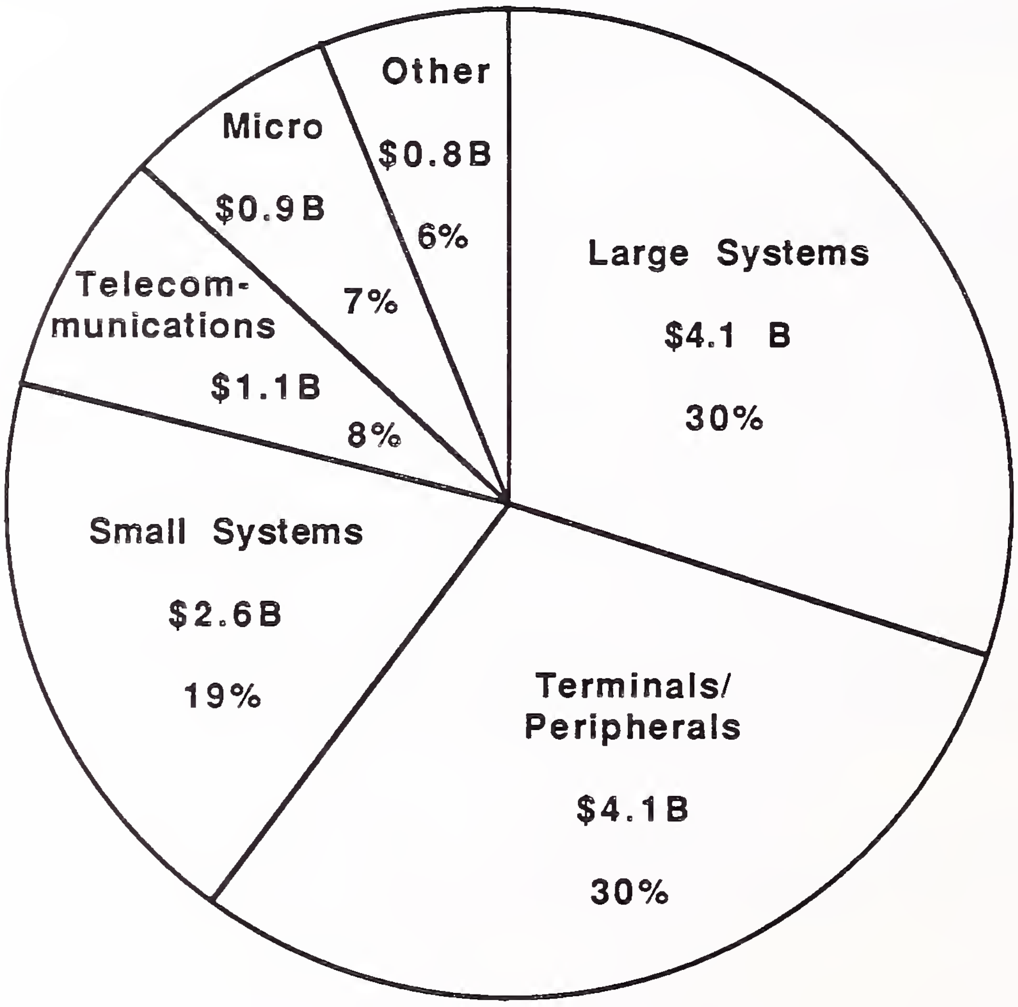
  - Decreased capital spending by medium- and large-sized corporations, which lengthened new product sales cycles.

  - Increased competition for the domestic systems market, caused by an expansion of the number of lower-priced alternatives available for each requirement, dividing the same "pie" into smaller "slices."

- This continued slowdown was also reflected by continued layoffs at major computer manufacturers, such as Data General, Wang, Honeywell, and the newly formed Unisys (formed from the merger of Burroughs and Sperry), to name a few. Even such traditional "full employment" vendors as Hewlett-

EXHIBIT V-1

1986 CUSTOMER SERVICE USER EXPENDITURES*
($ BILLIONS)



Total U.S. Service User Expenditures in 1986: $13.6 Billion

*Excluding TPM expenditures, special purpose systems, and user self-maintenance.

Packard and IBM have frozen new hiring and encouraged attrition through early retirement programs to lower costs. HP, for example, instituted a well publicized "voluntary early retirement" program that reduced the employment by approximately 1,500. And IBM, who has not had layoffs since the depression, reduced the number of college graduate hires and reassigned existing employees to revenue generating positions, both actions demonstrating a increased concern over the current economic state in the industry and at IBM.

- Throughout the slowdown in new product shipment growth, customer service growth has been fairly constant and steady. More significantly, the customer service organizations of most, if not all, computer manufacturers have been profitable. In fact, the customer service operations are often one of the few profitable parts of computer vendors, which led to the spinning off of the customer service organizations of at least two significant manufacturers, Datapoint and Mohawk Data Sciences, in 1985. This profit contribution has increased the importance of service, and service efficiency, in computer companies, and, as a result, should continue the expected service growth in the next five years.

- Exhibit V-1 also provides a breakdown of the overall customer services market by product type. Not surprisingly, the large systems (mainframe) segment, along with the peripherals segment (which is predominantly attached to large systems), is the largest segment of the overall market, constituting 60% of the total. The large systems market is currently the largest individual segment, at $4.1 billion in 1986, for a number of reasons:

  - Large systems users are least price-sensitive, due to their large capital investment in their systems, both in a purchase sense and in the value of processing performed.

  - Even though typical service price to purchase price percentages are only in the 2-6% range, the initial purchase prices start at $350,000 and fully configured systems easily exceed $15 million. Therefore, a single service contract can bring in up to $9 million a year.

  - User reliance on service in this segment is greatest, creating a large "aftermarket" requirement for additional support services, particularly in the highly profitable areas of consulting, training, and software support. Large systems service providers have responded to this by expanding their service offerings and by unbundling these services, making it easier to effectively (and profitably) price these services.

- The peripherals market is large due to the vast quantity of products that exist and require support. And while the purchase prices, and the resulting service costs, are nowhere near those of large systems, the sheer number of "boxes" installed contribute $4.1 billion in service revenues in 1986. Again, those peripherals attached to large systems contribute the largest share, since large systems logically can support more peripherals to begin with. Equally as important, users of large systems place greater importance on the system availability of their peripherals than users of smaller systems and, therefore, are less price sensitive than smaller systems users.

- The small systems segment is comprised of products ranging in price and capabilities from small business systems, such as the DEC PDP 11s that can start at $15,000, up to superminicomputer systems that rival mainframes in power and cost $500,000 and up. While the traditional minicomputer market has shown only marginal growth, the superminicomputer segment has exhibited growth in specific marketplaces, such as the scientific and engineering markets, as well as commercial users interested in the improved price/performance of these new computers. The company that has taken best advantage of this interest has been DEC with its new VAX 8XXX product line.

- The telecommunications segment of the overall market is one that promises high growth while, at the same time, is very difficult to define currently. INPUT examines the separately billed segment of the market that encompasses "standalone" (or those products not within the DP system) products. These products, predominantly modems, multiplexors, PBXs, local area networks, earth stations and dish antennas, currently receive little direct support.

- Modems and multiplexors are predominantly hardware-oriented, with typical support delivered in the form of depot maintenance. Product prices are relatively low, and product (hardware) reliability is extremely high.

- Local area networks (LANs) are predominantly software-oriented, with typical support in the form of operational training and, when necessary, mailed revisions and fixes.

- PBXs are a mix of hardware and software, requiring the closest blend of support to that needed in the DP world. Thus, support is usually provided on-site, with emphasis placed on timely response and repair times.

- Given this perspective, the current market size of $1.1 billion may appear small. However, the rapid development of new products within this segment, spurred by the promise of increased coordination and connectivity with traditional DP functions, suggests that service and support functions should grow very rapidly. Early indications of this development already exist:

  - User requirements for service and support, particularly in the areas of planning, training, and consulting are increasing rapidly. User dissatisfaction with the current state of telecommunications support has moved a number of users to perform the support themselves, leaving potential support revenues "on the table" while doing little to increase user satisfaction with the vendor or the product.

  - Some vendors are already recognizing and addressing this increased requirement for service by increasing the amount of service options and, at the same time, marketing these new services in such a way that demonstrates their increased importance. Vendors who have already instituted programs in this direction include Pacific Telesis and AT&T.

- TPM interest and activity has increased dramatically in the last year, as larger TPM organizations recognize the increased opportunity resulting from the growing disparity between user requirements for service and manufacturers' offerings. Furthermore, the mixed-shop nature of telecommunications systems lends itself well to TPM.

- The main obstacles to further TPM penetration into this market have been the slow development of service expertise and access to technology (e.g., remote and other forms of diagnostics, particularly on mixed-vendor networks).

- Historically, the early explosive growth in the microcomputer market caused much optimism concerning the potential for add-on services and products, including service. While some argued that rapidly declining prices and improved reliability would transform the micro into a disposable commodity, others felt that the rapidly growing product base offered unlimited growth potential.

- To some degree, both groups were correct. Prices did fall dramatically, and the products did become more reliable. At the same time, the expanding product base and increasing economies of scale made it more economical to provide timely on-site support to business users. However, the "disposable" micro did not appear, since business users continued to find larger and more sophisticated applications for their micros and vendors increased the capabilities of their "standard configuration" systems, thus maintaining essentially stable prices (a standard business-use system, while much more powerful, has essentially stayed in the $2,000 to $3,000 range). Furthermore, certain applications required on-site attention, particularly if the internal memory size prohibited the simple replacement of the failed unit or if the user was involved in a connected application (e.g., micro-to-mainframe or micro-LAN application).

- At the same time, the micro service market did not develop to the optimistic expectations of others, in part due to a trailing off of the micro market. The micro manufacturers and service vendors also had to share in the blame. Few manufacturers established extensive service delivery offerings, preferring to place the responsibility on the distribution source, other third parties, or the end users themselves. After first establishing service pricing as a percentage of the purchase price (typically 15-20%), the resulting prices appeared excessive to a large percentage of users. By the time that users began to recognize the importance of service, service providers had already begun to price service so competitively low that few vendors could make sufficient margin on micro service. And perhaps the most glaring mistake in micro services was the service franchise effort, which overestimated the "walk-in" service potential, underestimated the costs involved in setting up a service operation, and eventually found its potential market base consumed by manufacturers, TPMs, and retail distributors.

- On the surface, the micro service market appears large, almost limitless. On closer examination, the market should be broken down into the major CPU manufacturers of IBM, Apple, and the "clones" (PC- and XT-"workalikes"). Then, the market should be further broken down into the peripherals commonly found at micro sites (this number easily exceeds 100). Of course, this breakdown does not take into account the hundreds of various software packages possibly located at each site. It becomes apparent that the resulting breakdowns indicate that possible product densities can become quite small. To properly cover such a dispersed service population can place unreasonable demands on resources, particularly spare parts.

- Still, the picture is not completely bleak. First of all, there is an exceedingly large base of micro users in business use that has become less dispersed (thus less costly to support). Large corporate usage has become increasingly centralized to the extent that corporate MIS now includes the function of microcomputer management. Applications involving micro connectivity require more complete support offerings, with less price sensitivity as a result. And the increased use of micros in smaller business applications (e.g., small retailers using micros for cash register/inventory management/accounting functions) spawns a new and growing market for vertically-oriented support services.

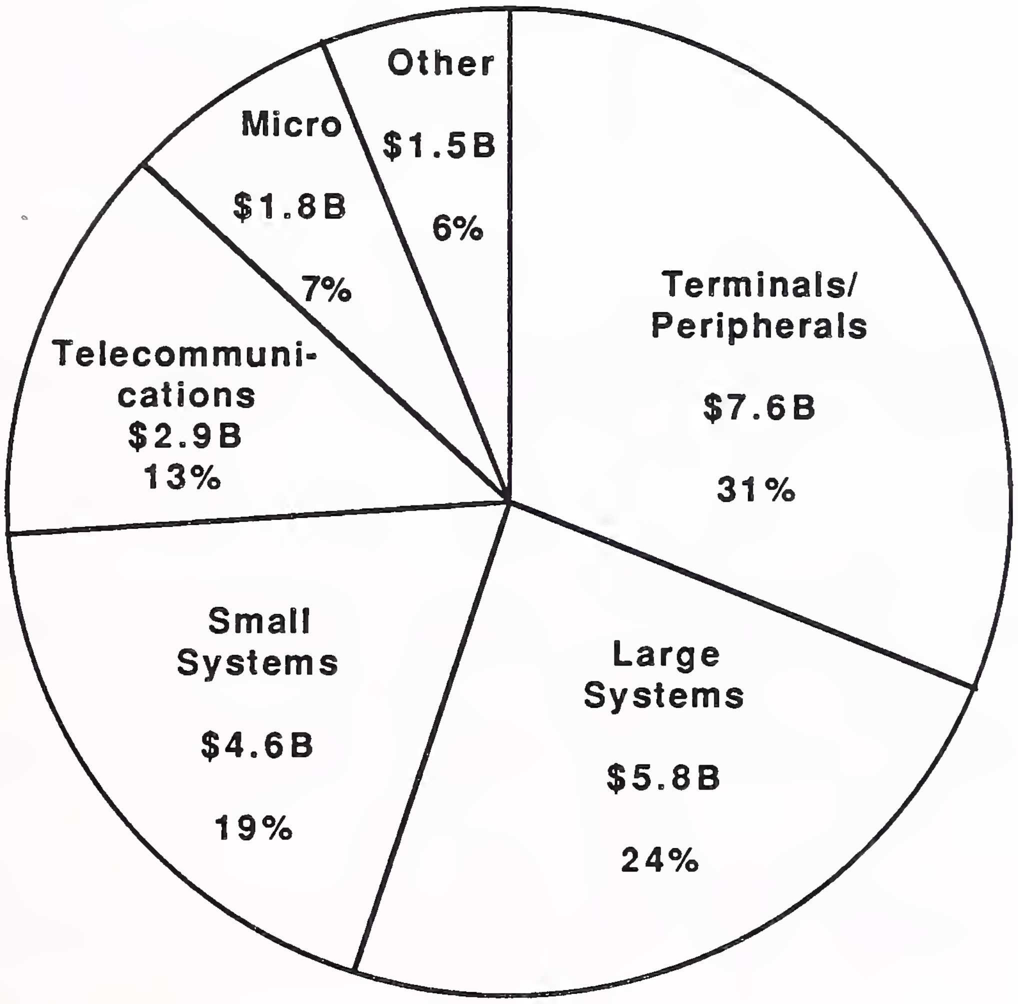
- By 1991, the overall customer service market composition will change, as shown in Exhibit V-2, reflecting the growth of telecommunications service as more users take advantage of the increased use of networked systems. This is not to suggest that mainframe products are going to be replaced by networked departmental systems. Rather, corporate users will bridge smaller systems more efficiently with centralized mainframes, allowing complete downline loading and uploading of data from the corporate data bases.

- It is safe to expect that mainframe service growth will continue to be slow, as manufacturers continue to price service aggressively in order to attract customers. In addition, mainframe service operation efficiency will continue, allowing vendors to continue to price service more competitively while still maintaining healthy service margins. Increased use of remote support services, coupled with continued development of multiprocessor systems, should keep prices at or below 2% of purchase price, while competitive forces (including increased competition from superminicomputer manufacturers) should maintain or even lower purchase prices.

- An existing trend that should continue well into the forecast period is the hesitancy of users to purchase larger systems, preferring to add memory to their existing system until economic conditions improve or until a significantly advanced product emerges that warrants the new purchase. As a result, peripheral sales and service should continue to grow. In fact, by 1991 INPUT projects that terminal/perpheral service will be the largest dollar contributor to the overall customer services market, thus giving credence to the position that many systems manufacturers take a loss on the CPU in order to make money on the peripherals, software, and services business that tags along.

EXHIBIT V-2

1991 CUSTOMER SERVICE USER EXPENDITURES*
($ BILLIONS)



Total U.S. Service User Expenditures in 1991 (Forecast): $24.2 Billion

1986-1991 AAGR: 12%

*Excluding TPM expenditures, special purpose systems, and user self-maintenance.

- Exhibit V-3 presents the expected user expenditure growth for customer services by product category. Note that while large systems growth is expected at only 7%, this area is still extremely significant on a total dollar basis ($5.8 billion by 1991 or more than twice the size of the faster growing telecommunications market). What is key, however, is that faster growing markets represent greater growth potential.

- One such market is the telecommunications product area. Currently, relatively low product prices combined with high reliability rates have made it difficult to build extensive service offerings, since traditional theory assumed that users of low cost/high reliability equipment would be extremely price sensitive. This ignores two factors present in the telecommunications market:

    - Telecommunications products are an integral part of the user's total IS (information systems) strategy. Thus, when a telecommunications device (e.g., modem) goes down, the entire IS capabilities are impacted.

    - Telecommunications users have expressed an increased requirement for more and better service. While users may be sensitive toward price increases for "traditional" services (e.g., remedial maintenance), users are quite attracted to premium services, particularly in the professional services areas that improve telecommunications use. INPUT studies have shown that such services as network planning and optimization are extremely attractive to users of "mixed-shop" systems.

B. CURRENT TPM MARKET AND FORECAST, 1986-1991

- Third-party maintenance (TPM), the provision of maintenance and support services on other manufacturers' products, has become an extremely

EXHIBIT V-3

U.S. CUSTOMER SERVICE USER EXPENDITURES* 1986-1991

PRODUCT SECTOR	$ BILLIONS		1986-1991 AAGR (Percent)
	1986	1991	
Large Systems	$4.1	$5.8	7%
Small Systems	$2.6	$4.6	12%
Microcomputers	$0.9	$1.8	14%
Telecommunications	$1.1	$2.9	21%
Terminals/Peripherals	$4.1	$7.6	13%
Other	$0.8	$1.5	13%
Total	$13.6	$24.2	12%

*Excluding TPM, special purpose sytems, and user self-maintenance.

important market for both traditional "independent" suppliers of TPM and, increasingly, for manufacturers who provide support on other manufacturers products. The U.S. TPM market is currently $1.56 billion, of which independents (e.g., Sorbus, Dataserv, etc.) make up 80%, manufacturers take 15% (up from 12% in 1985), independent board repair firms (such as CPX) make up 4%, and others bring in the remaining 1%.

- Exhibit V-4 provides a product breakdown of the U.S. TPM market for 1986 and projects into 1991. Note that while TPM represents less than 10% of the total U.S. customer service market (manufacturers comprise 83% of the total $15.9 billion spent on all forms of support, special purpose systems derive 5% of the total, and users make up the remaining), TPM service is growing at a very healthy 16%.

- TPM growth will be greatest in the traditionally strong terminal/peripheral product segment. Historically, TPMs have been successful in this area for a number of reasons:

    - There are a large number of "after-market" peripheral manufacturers who have created large installed bases without the service structure to support these products. Since the CPU manufacturer rarely covered "foreign" products, TPMs were able to pick up this business without much competition. DEC was instrumental in the development of this market since distributors of DEC systems were encouraged to find ways of keeping system configuration prices down by virtually any means, including using non-DEC peripherals. Thus, the DEC-compatible market became a strong TPM market. Interestingly, DEC has taken steps to recapture this market by offering TPM service on non-DEC peripherals on DEC systems.

    - Even on peripherals manufactured by companies with strong service structures and offerings, TPMs targeted peripherals with extremely low service prices as a way of getting "their foot in the door" at that user

EXHIBIT V-4

U.S. TPM SERVICE USER EXPENDITURES
1986-1991

PRODUCT SECTOR	$ MILLIONS		1986-1991 AAGR (Percent)
	1986	1991	
Large Systems	$177	$197	2%
Small Systems	$232	$425	13%
Microcomputers	$472	$1,065	13%
Telecommunications	$172	$620	18%
Terminals/Peripherals	$447	$820	29%
Other	$60	$130	17%
Total	$1,560	$3,257	16%

site. Since terminals have relatively little to service (thus little service cost to incur), the terminal market was used extensively for this purpose.

- TPMs, led by TRW, developed "service management" philosophies that worked with manufacturers without service capabilities to provide service and sales assistance. Thus, the TPMs became (strategic) partners with these manufacturers (who were often peripheral manufacturers), and each partner hoped to benefit from the arrangement. Since the agreements were almost always multiyear, the TPMs were assuring long-term growth (long term, of course, if the manufacturer was successful in building a product base).

- The micro market was also a target largely by the default of the manufacturers. Early in the development of the micro market, the emphasis was placed on the distribution of micros. Thus, to enter the market quickly enough, many manufacturers relied on their distribution source, typically retail chains, to provide support. Even companies with large service organizations, including IBM, recognized the difficulty in supporting the dispersed product base, and as a result also relied on the distribution sources. During this time, TPMs were already in full swing in the "service management" strategy, so TPMs were able to secure long-term agreements with micro manufacturers (the most notable being the RCA/Apple agreement). Also, TPMs were able to successfully target large corporate users who preferred to deal with a nationwide TPM versus local retailers.

- By 1984, TPMs were able to collar 43% of the micro service market. About this time, manufacturers, most notably IBM, became increasingly active in the micro support area. Improved product densities, increased pressure from corporate users, and decreased price sensitivity all were factors that encouraged manufacturers to assume a more direct participation in micro service and support. Thus, manufacturers assumed 52% of the 1985 micro service market (up from 43% in 1984), causing the TPM portion of the micro service market to shrink to 34%, as shown in Exhibit V-5.

EXHIBIT V-5

TPM PENETRATION, 1986

PRODUCT SECTOR	$ MILLIONS 1986 TOTAL	$ MILLIONS 1986 TPM USER EXPENDITURES	TPM MARKET PENETRATION (Percent)
Large Systems	$4,317	$177	4%
Small Systems	$2,854	$232	8%
Microcomputers	$1,408	$472	34%
Telecommunications	$1,316	$172	13%
Terminals/Peripherals	$4,551	$447	10%
Other	$831	N/A	-

- Hardest hit by this development was the micro service franchise movement, which was led by such vendors as Serviceland (now entering Chapter 11), Computer Repair Corporation (CRC), and The Computer Doctor. Basically, service franchise efforts hoped to exploit the tremendous growth in the micro industry by repeating in service what Computerland had done in the hardware sales area. Potential franchisees would pay up-front fees and percentages of sales in order to carry a "nationwide recognizeable name," along with additional benefits in marketing and spares acquisition/management. The market would be carry-in (befitting a "storefront" business), although some franchises would emphasize on-site service to business users.

- Although a fundamental problem with the service franchise effort was the slowed growth in the marketplace, service franchises made a number of tactical errors:

    - They entered the market at a time when the manufacturers began to increase their own presence, thus the service franchises found their market being squeezed from the top by manufacturers who were targeting the large corporate users and by TPMs who had already built up nationwide recognition and service coverage, and from the bottom from retailers who had already established themselves and had the built-in advantage of selling the service contract at the time of the sale.

    - Service franchise overestimated the "allure" of storefront service, since business users (the more consistent user of service) were not attracted to carry-in service. As a result, the only franchises that had a remote chance at success were those located near a large number of small users (small businesses, individuals who used their micro for home use, university students, etc.).

- Franchises often erred in the actual placement of their service locations. One specific Serviceland was located 30 miles east of Kennedy Airport, thus missing the Manhattan market. A Chicago Serviceland franchise was located more than an hour's drive from the Loop.

- In some cases, individuals considering entering did not fully appreciate the costs involved in setting up and running a fully functional depot repair facility, let alone one that would also provide on-site support. Even still, potential franchisees shied away from the initial costs (e.g., up-front fees). Serviceland never approached even a third of the 100 service locations that they predicted they would have.

- During the forecast period, this trend of increased manufacturer participation in micro service will reverse itself, due to two major unseen occurrences:

  - IBM limited entrance into the micro TPM market in 1986. In May, IBM announced that it would remove or disconnect a non-IBM machine and/or feature and replace it with a similar non-IBM machine and/or feature. In June, IBM furthered its TPM involvement by announcing on-site and depot prices for the servicing of 13 different manufacturers of PC-compatible peripherals and other add-ons. Previously, IBM viewed its service as a major sales feature, and it was unlikely that IBM would ever allow its service to help the sales of others' products. While IBM's entrance into the TPM market is limited currently to products commonly present at business PC users' systems anyway, one cannot underestimate the service impact of this development.

  - The explosion in the inexpensive "clone" business, which started late in 1985, but by 1986 had made enough of an impact to cause concern over IBM's continued involvement in the low-end micro business. When even business users opted for these foreign-made PC- and XT- "workalikes" (e.g., Leading Edge and PC Limited), the fact that these products had

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  - The explosion in the inexpensive "clone" business, which started late in 1985, but by 1986 had made enough of an impact to cause concern over IBM's continued involvement in the low-end micro business. When even business users opted for these foreign-made PC- and XT- "workalikes" (e.g., Leading Edge and PC Limited), the fact that these products had no support opened a new market up to TPMs. Furthermore, these clones not only impacted IBM sales, but to a greater extent displaced sales of other large manufacturers of PC-compatible micros (e.g., Tandy, AT&T, Texas Instruments) with extensive manufacturer support offerings.

- The "clones" issue raises an interesting question--who is going to support these low-priced machines. Even though most of the parts are readily attainable, the already large number of different brands will make it difficult to target a sufficiently dense service base to profitably provide service. Currently, support is being left to the retailers and the users. As more business users choose these lower-priced alternatives, the question remains whether TPMs will, or even should, attempt to go after this market.

- By 1991, INPUT expects that TPMs will capture 47% of the business micro market, as shown in Exhibit V-6. The exhibit also shows the expected increase in activity that TPMs will demonstrate in the telecommunications market, particularly as TPMs gain experience with that technology.

C. CURRENT SMALL SYSTEMS SERVICE MARKET AND FORECAST, 1986-1991

- As shown previously (in Exhibit V-1), the small systems segment of the 1986 overall customer services market is $2.6 billion, which represents a 13% growth over 1985 small systems user expenditures for service. Product sales growth in this market have been mixed--the traditional minicomputer segment (with such products as the DEC PDP 11 and the IBM System 36) remained relatively stagnant, while the superminicomputer segment (led by such products as the DEC VAX line and the newly released IBM 9370) has shown strong growth. The small systems segment may be one of the few computer marketplaces in which IBM is not the undeniable leader, in part due to the

EXHIBIT V-6

TPM PENETRATION, 1991

PRODUCT SECTOR	$ MILLIONS		TPM MARKET PENETRATION (Percent)
	1991 TOTAL	1991 TPM USER EXPENDITURES	
Large Systems	$5,997	$197	3%
Small Systems	$5,025	$425	8%
Microcomputers	$2,272	$1,065	47%
Telecommunications	$3,072	$620	20%
Terminals/Peripherals	$8,047	$820	10%
Other	$1,500	N/A	-

strong presence of minicomputer-specialist DEC's strong product line and due to IBM's lack of cohesiveness between its minis and the rest of its product line.

- DEC has successfully crossed over from the scientific and engineering market to the commercial market, largely on the strength of its VAX family of supermincomputers, which began in October 1977 with the VAX-11/780 and continued through August 1986 with the VAX 8700. Beyond the expected benefits of small size and high performance, the DEC product family could boast software compatibility throughout its entire line of minis and superminis. So that while IBM users were faced with as many as 15 different architectures (now being whittled down to three--the 370, the System 3X, and the PC architectures) and at least three systems (System 36, System 38, and 370) just in the small systems segment, DEC was successful in creating a family of computers built along one architecture. Thus, connectivity became a key issue in the selection of small systems in the 1980s.

- In October 1986, IBM announced a new family of computers that would reduce the midrange confusion that hindered its growth in this market. Built along the 370 mainframe architecture, the 9370 Information System line of computers (already being referred to as the "VAX-busters") boasts better price/performance ratios and lower maintenance costs than the comparable VAX 8XXX products. Furthermore, by introducing such a complete line of products (base system pricing ranges from $31,000 to $210,000), IBM is signaling its intention to simplify its midrange product offerings around its most accepted architecture (370). This architecture is expected to extend down into the microcomputer (eventually ignoring the currently available but relatively minor installed base of the XT/370) to provide a cohesive product line. In addition, the new line conforms to a number of preexisting industry standards, such as Ethernet, Multibus, Serial Original Equipment Manufacturer's Interface (SOEMI), and TCP/IP. Thus, the 9370 family will be able to interact with a variety of other hardware.

- With the 9370 family, IBM can make a concerted push into the departmental processing market, currently a DEC, HP, and Unisys (Sperry) stronghold. Large corporations with significant investments in IBM equipment, particularly mainframe installations, will be most attracted to the IBM product offering; smaller corporations and technical users will opt for the HP and DEC alternatives. And if IBM is successful in attracting a sufficient number of third-party software vendors to develop software for the new system, which should be easier due to the new Transparent Services Access Facility (TSAF) that provides VM program-to-program support, IBM will be successful at penetrating key vertical markets, such as manufacturing.

- While DEC and IBM battle it out in the high-end superminicomputer segment, Palo Alto-based Hewlett-Packard continues to tie its future to the Reduced Instruction Set Computing (RISC) Spectrum product line, which is now expected by mid-1987 (a delay of six months, after another prior delay of what is believed to be six months to one year). RISC computers are attractive, particularly in the small systems market, because the design uses primitive instructions that operate in a single machine cycle, thus consuming less power, giving off less heat and noise, taking up less room, and executing five times faster. The emphasis (and investment) is placed not on hardware, but on the compilers necessary to translate code into the computer's reduced instruction set. Thus, RISC computers allow very complex software to run on relatively simple but fast hardware.

- A number of vendors are already in the RISC market--Pyramid Technology, Ridge Computers, and IBM (with their PC/RT). So far, HP's entrance is the largest, and the largest gamble, due to the large installed base of existing HP 3000 users who will need to migrate to the new RISC-based systems to stay within the HP high end. And it is in this area that HP is encountering the greatest difficulties. Although HP President John Young attributes the delay to a "tuning problem" that is "substantial" but "is independent of the new architecture," initial delays in delivery were attributed to software conversion problems. HP users awaiting the new machines have been patient, a testament to the tremendous user-loyalty that results from the quality of HP's products and support. However, user patience is growing thin, and although HP financials have been positive recently (a result of expense cutting, as well as continued strong performance in instruments and peripherals), users will soon look to other vendors if HP encounters any more problems.

- Another small systems vendor who is attempting to expand from the technical market to the commercial marketplace is Data General. Since 1981, with the introduction of its Comprehensive Electronic Office (CEO), an integrated office automation (OA) package that competes head-to-head with DEC's All-In-One software package, DG has been aggressively pursuing business in the very competitive superminicomputer marketplace with their 32-bit MV series, while known for its Nova and Eclipse processors sold to scientific and engineering users, CEO introduction, and the recognition that corporate users were looking for smaller (more manageable) integrated systems that could handle a number of different applications.

- While DG has been pushing for greater presence in the commercial market, others, such as DEC, Sun Micro, and Apollo, have been eroding away at their technical business. And small systems leaders, DEC and IBM, have been releasing more powerful commercial systems at a faster rate than Data General. Thus, Data General results have been disappointing, reflected in a series of layoffs and other personnel reorganizations in 1986.

- To counter this downturn, particularly in the faltering low end market, Data General has released the MV/7800 to compete with DEC's Microvax II and Wang's VS 65.

- A strong performer in the high end of the small systems market has been Tandem, a leader in the fault-tolerant on-line transaction market. Tandem first built its presence in vertical markets that needed to handle large transaction loads, such as the airlines industry, hotel industry, car rental industry, and financial services industry. Tandem is now expanding into the banking and manufacturing industries as the cost-per-transaction drops. Tandem also hopes to make a push into the point-of-sale (POS) market.

- The traditional minicomputer market is being attacked from supermicrocomputer products that are becoming increasingly powerful. Such systems manufactured by Apollo and Sun Microcomputer are already well established in technical applications. Traditional minicomputer manufacturers like DEC and IBM have countered with powerful products of their own (Microvax II, PC/AT, and PC/RT). Sun has recently established service as a separate division within the corporate structure. This move, along with a doubling of their field engineer population, indicates Sun's recognition of the importance of service to these business users (particularly former mini users) and to Sun's long-term success.

D. SMALL SYSTEMS SERVICE REVENUE SOURCES, 1986-1991

- As previously shown in Exhibit V-1, the small systems service market is $2.6 billion in 1986. While all segments of the computer industry, both hardware and software, have been impacted by larger economic forces, the small systems market has been less affected due to the rapid advances in the superminicomputer segment. It is in this segment that small systems service has been most successful, both on a revenue and on a profit basis.

- The superminicomputer service segment should continue due to a number of factors:

  - Supermini manufacturers, led by DEC, IBM, and Tandem, have emphasized service and support, building extensive service offerings that feature educational and professional services.

  - Supermini users are less price sensitive than other segments, recognizing the importance of quality service to the high system availability requirements that they have.

  - Supermini design incorporates a high level of remote support and redundant features that help reduce the costs of delivering service.

- Traditional minicomputer service growth will be limited, due to the stunted growth in that segment of the market. Traditional minicomputer manufacturers are emphasizing their supermini offerings, and supermicro products are replacing older minis in many applications.

- In the following section, INPUT will break down small systems service revenue into the components of hardware maintenance, software support, educational services, and professional services.

I. HARDWARE MAINTENANCE

- As shown in Exhibit V-7, hardware maintenance activities contributed $2.1 billion, or 80% of all small systems service revenue, in 1986. Traditionally, computer service and support was virtually all hardware-oriented, as other groups within the computer vendor often handled non-hardware maintenance activities.

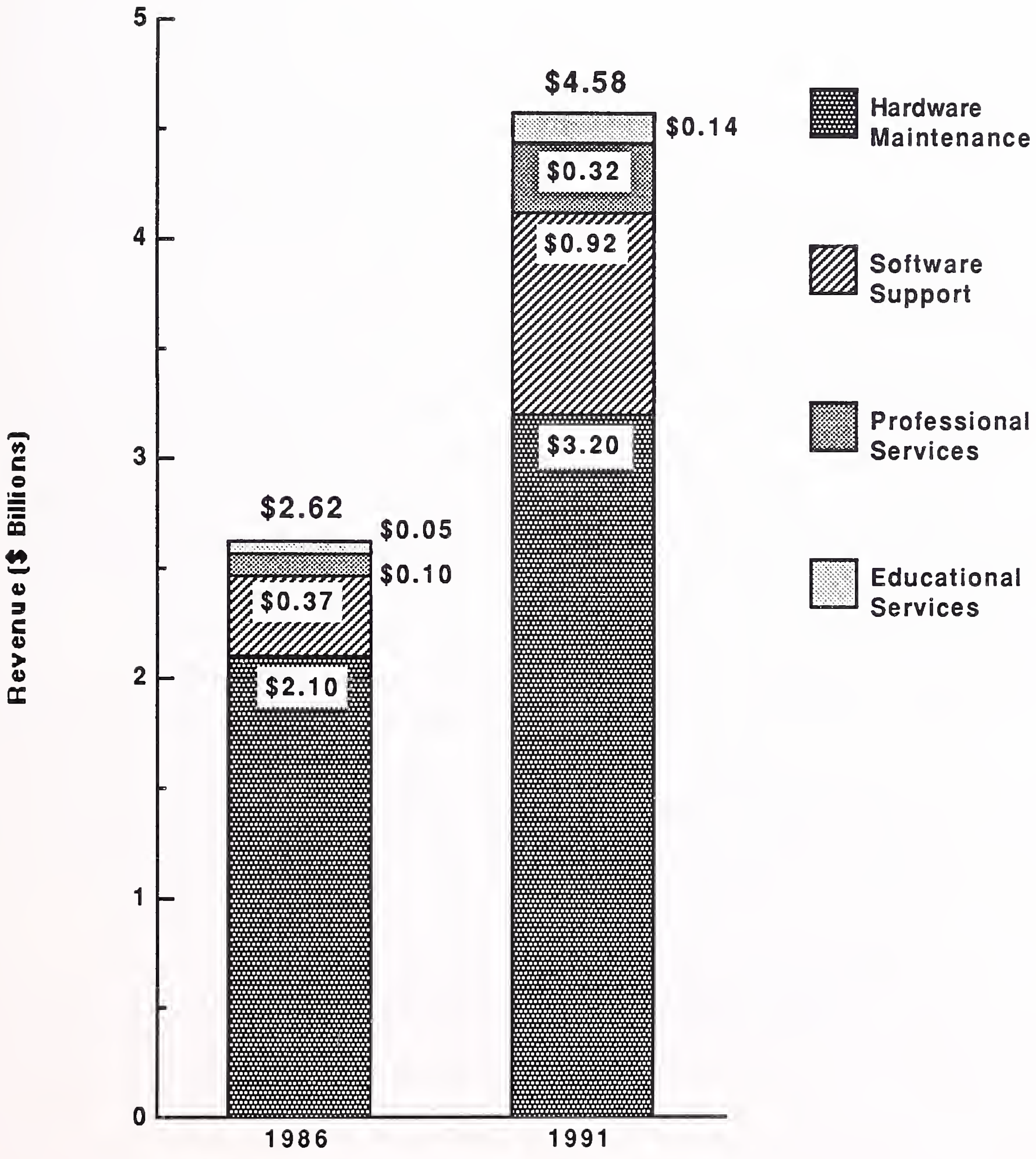
  - Software support was usually handled by a software development team outside of the service organization, by outside software vendors, or by the user organization.

  - Educational services were typically handled by the sales organization. Initial training was usually provided free.

  - Professional services were either bundled into the purchase price (planning services) or handled by product development (consulting).

EXHIBIT V-7

SMALL SYSTEMS SERVICE REVENUE MIX
1986-1991



- In the early 1980s, many of these non-maintenance activities were moved to a more centralized customer services organization. Furthermore, customer services organizations were looked at as a profit contributor (versus a cost center), thus service organizations looked at these new service areas for their profit potential. Most computer manufacturers began to unbundle services away from hardware maintenance contracts to better exploit their revenue- and profit-generating potential. Foremost leaders in this effort were IBM (active in all markets but strongest in the large systems segment) and two small systems specialists--Digital Equipment Corporation and Hewlett-Packard. Both of these last two vendors were successful in introducing a wide range of services, or service "menu," that allowed users to choose the services and service level that best fit their needs and budget. Furthermore, this allowed DEC and HP to price and market these services at levels that would optimize sevice coverage and profit potential.

- Thus, it is understandable that hardware maintenance activity revenue contributions will decline, since many services that were bundled into maintenance contracts are now handled separately. Furthermore, user requirements for these non-hardware maintenance services are growing at a faster rate, decreasing user price sensitivity for these services and increasing user acceptance of these services.

- Also, hardware is becoming increasingly reliable, aided by improved manufacturing processes, increased use of modular design (which also speeds diagnosis and repair), increased use of remote support capabilities, and the increased use of redundant processing design, particularly in the superminicomputer segment. Thus, hardware support costs are reduced, causing hardware maintenance prices to fall.

- Hardware revenue growth will also decrease due to price drops resulting from other competitive factors, particularly as the small systems market becomes more competitive. Service organizations are under constant pressure to reduce service prices, not only from the users but also from the service organization's own sales organization.

- Thus, hardware maintenance activities should continue to provide a majority of all service revenues throughout the forecast period, but the 1991 revenue mix will reflect the growing importance of other service areas, particularly software support.

2. SOFTWARE SUPPORT

- An area of rapid growth potential is systems software support. Exhibit V-8 shows that systems software support contribution will grow from $370 million, or 14% of total service, in 1986 to $920 million, or 20% of total small systems service, in 1991. This represents a 20% average annual growth rate (AAGR) over the forecast period, which far exceeds the overall small systems growth rate of 12%. During the forecast period, systems software support is expected to add an additional $550 million in service revenue, as shown in Exhibit V-9.

- It is important to note that systems software support already contributes a significant proportion of total service revenue in the small systems market. This is true largely in the development of the superminicomputer market, which emphasizes software and software performance as well as incorporating modular design, redundant processing, and remote support technology.

- Although continuing user demand for increased and improved system software support will contribute to this growth potential, service vendors have alaready actively taken steps to put in place the mechanism to meet the needs of their users. Unfortunately, INPUT's research has found that user requirement levels are increasing at a faster rate than the manufacturers have been able to provide, particularly in the superminicomputer segment.

EXHIBIT V-8

U.S. SERVICE GROWTH, 1986-1991

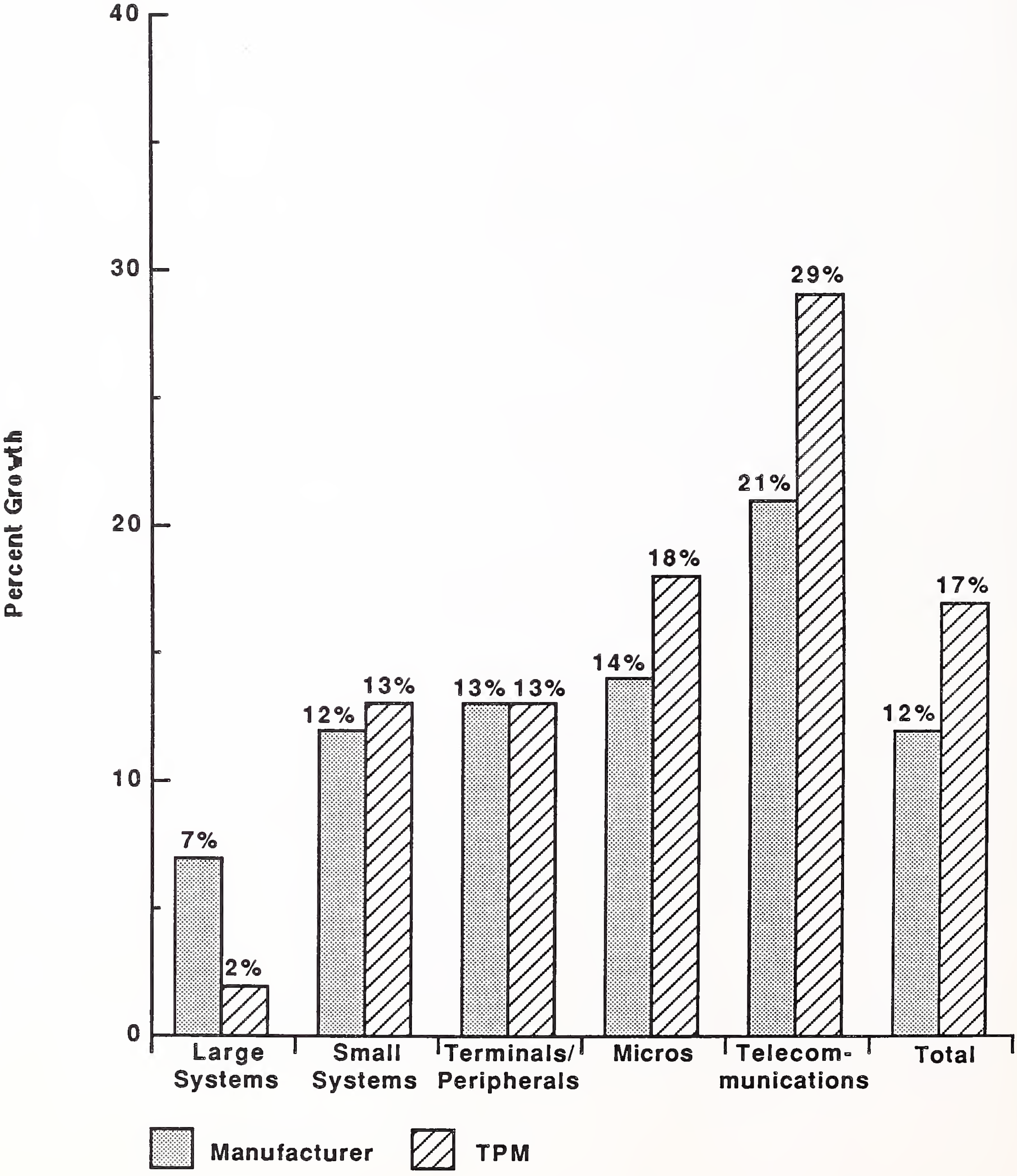
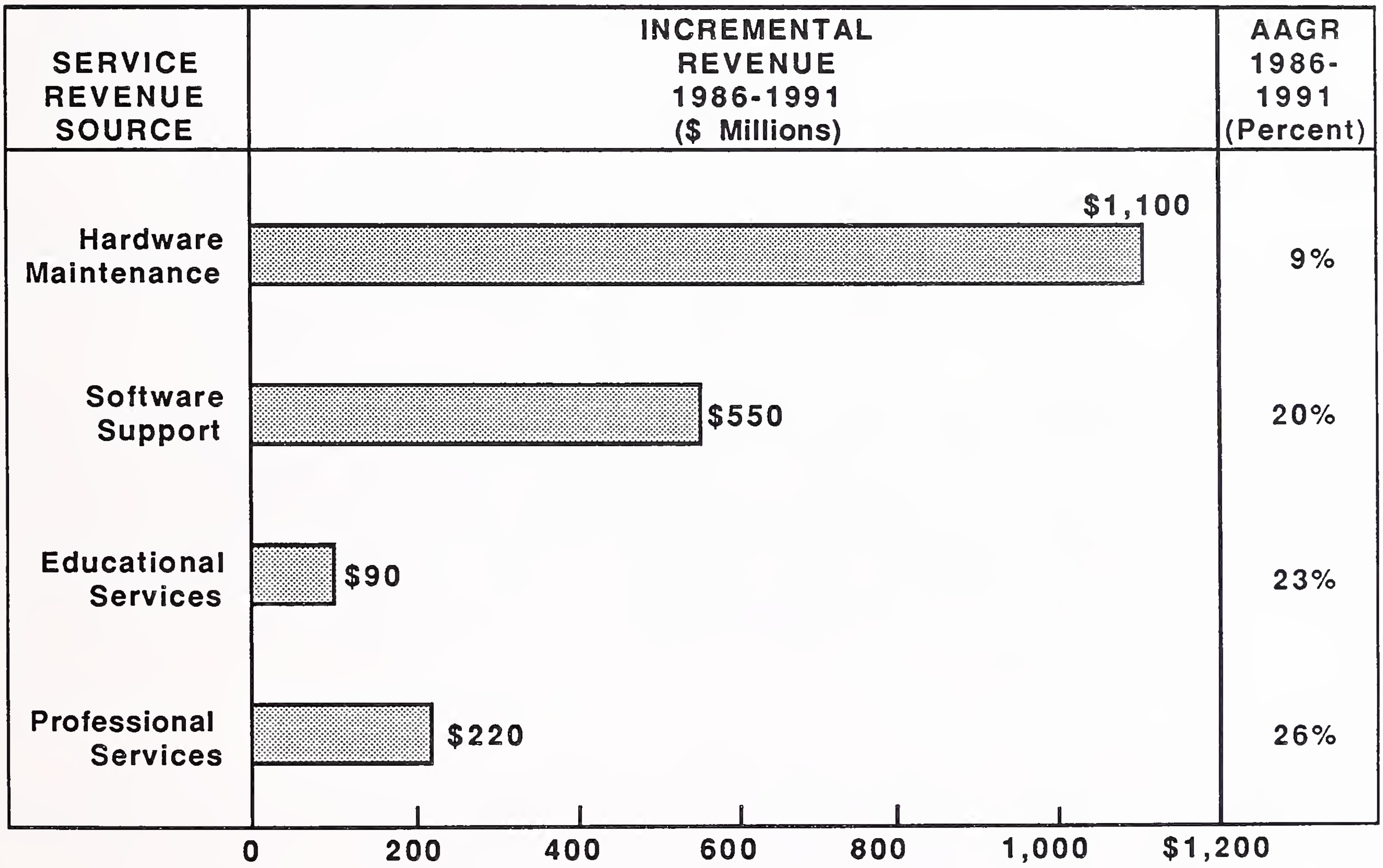


EXHIBIT V-9

SMALL SYSTEMS SERVICE GROWTH BY REVENUE SOURCE 1986-1991



- Requirements for software support, both systems and applications, have increased dramatically for a number of reasons:

  - Users are becoming involved with increasingly complicated applications, both as a result of advancements in the software programs themselves (e.g., micro-host applications, departmental applications) and as a result of users pushing the limits of their older systems while waiting to upgrade.

  - Users are often forced to compete for a limited number of programmers, thus requiring more training and vendor support. One systems software vendor noted that a significant number of their users' average experience level has halved.

  - Users are handling an ever-increasing amount of data, and, with the increased use and integration of telecommunications, this increased demand will become more pronounced.

- In 1986, INPUT surveyed 190 supermini users concerning their requirements for all aspects of service, including software support. Although actual levels of support reported by users stayed about the same as last year's, overall satisfaction rates slumped considerably. Users reported greatest concern over documentation (a traditional problem in the eyes of the users) and software engineer skill level.

- It should be emphasized that this dissatisfaction also points out opportunities for those vendors who can identify priority service needs and address them with the user base. Prior INPUT studies indicate that small system users are less price sensititve concerning software support. In fact, users are often willing to pay significant premiums (averaging 10% over and above their current basic monthly service charge) to receive additional systems software support.

- It is important to make sure that these support services are readily apparent to the users, since it is as important to satisfy the users' perception of service as it is to actually perform the service (which helps explain users' lack of enthusiasm for remote software support). Thus, high visibility services such as telephone (hotline) support, training, and access to problems data bases all have a dramatic effect on user satisfaction. These high visibility services, coupled with effective remote support (which reduces the costs associated with problem resolution) will increase user satisfaction and provide an increased stream of revenue for the life of the product.

3. PROFESSIONAL SERVICES

- Professional services, performed both pre- and post-sale, are growing at the fastest rate (26% AAGR) over the forecast period. These services typically include such pre-sale vendor service activities as environmental planning, site planning, and installation planning, and such post-sale activities as consulting, network planning, and site management. In most instances, pre-sale professional services are provided free of charge to the user; however, most of the post-sale professional services have been successfully unbundled and priced accordingly. In any case, all professional services, whether performed at no cost prior (or during) installation or performed for a fee after installation, have a significant effect on user satisfaction, not only with service, but also with the product itself.

- INPUT feels that professional service growth is assured during the forecast period due to the increased use and reliance on multi-vendor systems and multi-product systems (such as departmental processing), especially those incorporating increasing amounts of telecommunications products. As user demand for consulting services increases, user price sensitivity will decrease, allowing vendors to improve service margins in this area. A further benefit is that increased activity in this area will allow manufacturers an improved opportunity to differentiate their service offerings from those of TPMs who may offer lower prices but only deal with hardware maintenance.

- Furthermore, the increased use of telecommunications products integrated into the corporate information systems (IS) activities will create an increased requirement for professional services, particularly network planning and integration services. INPUT research studies report that 77% of all telecommunications users perform network planning in-house, versus only 27% who receive such support from their manufacturer. This points out a tremendous opportunity for vendors with the expertise to provide such service, both as a new revenue and as a easily marketable "complete" service offering.

4. EDUCATIONAL SERVICES

- While educational services appear to be only a minor market in terms of revenue contribution ($50 million in 1986), this area makes a vital contribution to overall user satisfaction along with reducing the need (therefore the costs) for service. Furthermore, user requirements for additional education and training services have grown steadily in the past decade, both in the hardware and software areas. As a result, INPUT believes that educational service growth during the forecast period will be 23%, increasing the contribution to service revenue to $140 million in 1991.

- The growth in educational services has been aided by the degree of service offering "unbundling" that small systems vendors have adopted. In the past, the majority of end-user training was provided free of charge, usually during and immediately following installation. Increased user demand for continuing educational services, along with a vendor recognition to the need to hold the line on basic hardware maintenance prices, encouraged vendors to separate many traditionally "free" services, such as post-installation training, and charge for them separately. Currently, many small systems vendors, most notably DEC and HP, offer catalogs of individually priced training courses that cover a wide range of topic areas, from hardware preventive maintenance to software use and optimization.

- Small systems vendors are already recognizing the importance of providing more vertically-oriented training, both of an operational and service nature. Traditionally, minicomputers targeted at scientific and other technical applications have geared their educational offerings to fit the specialized requirements of their users (almost out of necessity). As more systems in commercial applications become niche-specialized, the training offerings will need to reflect this.

- Educational services have always been profitable, due in part to the fact that user price sensitivity in this area has traditionally been low. INPUT feels that educational services will become increasingly profitable as vendors replace traditional training methodologies, such as live instruction, with newer, more cost-efficient techniques, like video- and computer-based training.

- While traditional live (classroom) instruction is highly desirable to users, due to a great extent to the "human element," the costs involved with supporting a large user base can be quite high. Vendors have already adopted video-based methodologies with mixed success (users complain about the rigidity of video course structure, along with the unspoken concern about the lack of human contact). In addition, video-based training programs are expensive to update.

- Computer-based training (CBT) and the related computer-aided instruction (CAI) have been used to a limited extent, due to the initial high costs in program development. CBT use will increase dramatically for a number of reasons:

    - CBT allows student-paced instruction at the user's own terminal/workstation.

    - CBT is easily adaptable and can be inexpensively updated on a periodic basis. This can prove vital in small systems geared to vertical niche markets.

  - CBT program development costs are falling from the present $100,000 per hour.

- As the technology becomes more available and affordable, INPUT feels that CBT/CAI educational services will be supplemented or even supplanted by computer-generated custom interactive videodisk techniques. Videodisks can provide vast sums of data with fast access capabilities. In addition, videodisk technology can incorporate visual images (not just computer generated graphics), which lend themselves well for instructional purposes.

E. CONCLUSIONS AND STRATEGIC RECOMMENDATIONS

- In the following chapter, INPUT will address key small systems market issues and their effect on service delivery over the next five years. In addition, a series of strategic service objectives and recommendations will conclude this report.

- The small systems market is undergoing a evolutionary (versus revolutionary) transformation as users look to smaller yet more powerful solutions to their information handling and processing needs. Key phrases in the industry are integration, connectivity, and departmental processing.

- Vendors are reacting to this evolution with new products and new organizations. Successful products feature the ability to communicate as well as more obvious measurements of speed and power. And vendors are moving away from the "box" mass marketer role to one that provides a more complete "business solution." Vendors are also moving away from more generalized commercial products to more vertically-oriented systems that address industry niches.

- These trends (summarized in Exhibit V-10) have created the need for an evolution in the way that customer support is delivered. Small systems vendors have been on the forefront of providing service offerings that address the more specialized needs of users. As the use of small systems becomes more niche-oriented, customer service will also need to become more specialized. As suggested by Exhibit V-11, rising system availability requirements continue to dominate future service directions.

- An industry-wide trend has been, and will continue to be, the rapidly increasing systems availability requirements of DP users. Both mainframe and superminicomputer users are requiring systems availability performance approaching 100%, placing redoubled demands on manufacturers to improve equipment reliability and service performance. However, service performance, in terms of response and repair times, can improve only so much (and product reliability, while much improved due to manufacturing processes and quality controls, cannot eliminate the possibility of system failure, either hardware, software, environmental, or user-caused). Thus, small systems manufacturers will need to continue development and use of technological answers to this systems availability need.

  - Redundant systems, such as the Tandem, Stratus (System/88), and IBM.

  - Remote support services that not only provide remote diagnostic capabilities but also problem resolution.

  - Artificial intelligence (AI) and expert systems that can be incorporated with automated field service delivery.

- Small systems vendors have been the most innovative in their service offering structure, perhaps a result of the wider range of customers that their products cover. Two such vendors, DEC and HP, offer the widest range of service options, presenting service "menus" with at least a dozen separate service choices. By doing this, these vendors can present service plans that attract

EXHIBIT V-10

SMALL SYSTEMS MARKET ISSUES

- Superminicomputer Products Challenging Mainframe Applications
- Supermicrocomputers Replacing Traditional Minis
- Small Systems Becoming Focal Point in Connectivity
- Increasing Amounts of Remote Support

EXHIBIT V-11

SMALL SYSTEMS SERVICE ISSUES

- System Availability Requirements of Superminis Approaching Those of Mainframes
- RSS and Redundant Systems Only
- Software Support Key User Requirement
- Network Planning and Implementation Opportunities

service customers who can choose the level of service that best fits their needs and budget. Furthermore, the price of each service can be set at levels that attract service customers while still reflecting the costs involved in presenting that service. Pricing trends, shown in Exhibit V-12, revolve around the expansion of service "menus."

- Other vendors are becoming creative in their service offerings.

  - Data General, for example, offers price sensitive uers two lower priced service alternatives--a "REV-UP" option that provides upgrades and revisions for an annual charge and a "Cooperative Maintenance Agreement" that provides discounts on parts and service to users who perform redimentary maintenance themselves.

  - Gould also offers a plan for price sensitive users, Comprehensive Subassembly Exchange, that offers priority access to spare parts as well as conjunction management support.

  - Prime offers selected premium service offerings, including guaranteed response times and system availability guarantees, to users of all-Prime systems.

  - Wang, a company whose service reputation had been questioned, also now offers a wide range of premium services, including uptime guarantees of 95% and 98% and two-hour response times.

- These offerings not only reflect the vendor's desire to offer low-priced service offerings in what is becoming an increasingly competitive market, but also the desire to better fit the service offerings to their users' needs, rather than offering one service plan that tries to satisfy everybody. An additional benefit, beyond increased user satisfaction and increased revenue potential (both extremely attractive immediate benefits) is the extension of the number and types of services offered, better differentiating the manufacturers'

EXHIBIT V-12

PRICING TRENDS

- Larger Service Menus
- Increased User Involvement Prompting Discounts
- Premium Services Provide Revenue Opportunities
- Expanded Services Differentiate from TPM

service offerings from those of third-party maintenance organizations which tend to be hardware maintenance-oriented and compete more on a price basis.

- A vital service requirement that continues to go unmet is software support. Only three vendors (out of eight analyzed)--IBM, HP, and DEC--satisfied more than half (71%, 66%, and 60%, respectively) of their users' requirements for systems software support. The biggest problem areas were documentation quality and software engineer skill level.

- With the increased emphasis placed on software performance in the small systems environment, particularly in the superminicomputer segment, vendors will need to take visible steps to improve this area of support. Service organizations must become more involved in the design and quality control of end-user documentation since service is the first group to be called when a user is unclear on an operational issue. Furthermore, studies have shown that 60% of all software problem calls are the result of user misunderstanding or user misuse, reflecting the cost savings possible from better end-user education, including documentation.

- Vendors also need to incorporate new technologies into software support. For example, user accessible problems data bases are becoming commonplace in the industry, to the users' satisfaction. Vendors will need to incorporate this offering with remote support services, particularly downline loading of fixes. In addition, software support activities should incorporate AI and expert systems to aid in the diagnosis and resolution of problems.

VI APPENDIX

- The following section contains additional information sent at various times throughout the year to supplement the research findings for this module. Examples of such additional information includes sample questionnaires, definition lists, and industry summary exhibits.

APPENDIX VI-A: QUESTIONNAIRE

1. CPU manufacturer ______________________________

2. CPU model ______________________________

3a. What percent uptime do you require? (e.g. 99.9) ______________

3b. What percent uptime are you currently receiving? (e.g. 99.9)

____

4a. How many system interruptions do you have each month? (e.g. 0.5)

____

4b. What percent are hardware-related? (e.g. 75.0) ______________

4c. What percent are software-related? (e.g. 25.0) ______________

HARDWARE SUPPORT

5a. What is your requirement for hardware response time (CPU on-site)? (e.g. 1.0 hours)

____

5b. What do you currently receive? (e.g. 1.0 hours) ______________

6a. What is your requirement for hardware repair time? (e.g. 1.0 hours)

____

6b. What do you currently receive? (e.g. 1.0 hours) ______________

7a. Please rate, on a scale of 1-10, your requirements for the following hardware goods and services.

7b. Please rate your current level of satisfaction with the services you receive from your hardware maintenance vendor.

	a. (Require)	b. (Current)
1. Hardware documentation	________	________
2. Hardware training	________	________
3. Hardware consulting	________	________
4. Hardware remote support	________	________
5. Hardware engineer skill level	________	________
6. Parts availability	________	________
7. Hardware Service Overall	________	________

SOFTWARE SUPPORT

8a. What is your requirement for systems software response time? (e.g. 1.0 hours)

____

8b. What do you currently receive? (e.g. 1.0 hours) ____________________

9a. What is your requirement for systems software fix? (e.g. 1.0 hours)

____

9b. What do you currently receive? (e.g. 1.0 hours) ____________________

10a. Please rate on a scale of 1-10 your requirement for the following systems software goods and services.

10b. Please rate on a scale of 1-10 your current level of satisfaction with the systems software goods and services you received.

	a. (Require)	b. (Current)
1. Software documentation	______	______
2. Software training	______	______
3. Software consulting	______	______
4. Software remote support	______	______
5. Software engineer skill level	______	______
6. Software Support Overall	______	______

OTHER SUPPORT

11. Do you currently use third-party maintenance on any of you DP equipment? (yes = 1, no = 2)

____

12. (If yes on 11) What TPM vendor are you using?

____

____

13a. What is your requirement for any of these following services?

13b. What would you consider a reasonable premium to pay for these services (over and above BMMC)? (ask part "b" only if part "a" require equals or exceeds "5")

		a. (1-10)	b. (Percent)
1.	Standby coverage	________	________%
2.	Remote diagnostics	________	________%
3.	Scheduled PMs during non-prime hours	________	________%
4.	Deferred response time (discount)	________	________%
5.	Under 2 hour response time (premium)	________	________%
6.	Maintenance management	________	________%

14. On a scale of 1-10, what is your willingness to participate in the following support activities?

		(1-10)
a.	Work with a support center to diagnose problems	________
b.	Install software patches or modifications	________
c.	Install circuit boards or hardware modules	________
d.	Deliver equipment to a depot	________

15. In which single service area would you like your vendor to improve?

____

____

____

____

____

Thank You!

APPENDIX VI-B: DEFINITIONS

- APPLICATIONS SOFTWARE - Software that performs processing to service user functions.

- BOC - Bell Operating Company.

- CONSULTING - Includes analysis of user requirements and the development of a specific action plan to meet user service and support needs.

- DISPATCHING - The process of allocating service resources to solve a support-related problem.

- DIVESTITURE - The action, stemming from antitrust lawsuits by the Department of Justice, which led to the break-up of AT&T and its previously owned local operating companies.

- DOCUMENTATION - All manuals, newsletters, and text designed to serve as reference material for the ongoing operation or repair of hardware or software.

- END USER - May buy a system from the hardware supplier(s) and do own programming, interfacing, and installation. Alternatively, may buy a turnkey system from a systems house or hardware integrator.

- ENGINEERING CHANGE NOTICE (ECN) - Product changes to improve the product after it has been released to production.

- ENGINEERING CHANGE ORDER (ECO) - The followup to ECNs which include parts and a bill of material to effect the change in hardware.

- ESCALATION - The process of increasing the level of support when and if the field engineer cannot correct a hardware or software problem within a prescribed amount of time, usually two to four hours for hardware.

- FIBER OPTICS - A transmission medium which uses lightwaves.

- FIELD ENGINEER (FE) - For the purpose of this study, field engineer, customer engineer, serviceperson, and maintenance person were used interchangeably and refer to the individual who responds to a user's service call to repair a device or system.

- HARDWARE INTEGRATOR - Develops system interface electronics and controllers for the CPU, sensors, peripherals, and all other ancillary hardware components. May also develop control system software in addition to installing the entire system at the end-user site.

- ISDN - Integrated Services Digital Network. A proposed standard for digital networks providing transport of voice, data, and image using a standard interface and twisted pair wiring.

- LADT - Local Area Data Transport. Data communications provided by the BOCs within local access transport areas (LATA).

- LARGE SYSTEM - Refers to traditional mainframes including at the low end IBM 4300-like machines and at the high end IBM 308X-like machines. Large systems have a maximum word length of 32 bits and a standard configuration price of $350,000 and higher.

- MEAN TIME BETWEEN FAILURES (MTBF) - The elapsed time between hardware failures on a device or a system.

- MEAN TIME TO REPAIR - The elapsed time from the arrival of the field engineer on the user's site until the device is repaired and returned to the user for his utilization.

- MEAN TIME TO RESPOND - The elapsed time between the user placement of a service call and the arrival at the user's location of a field engineeer.

- MICROCOMPUTER - A microprocessor-based single- or multi-user computer system typically priced less than $15,000. A typical configuration includes an 8- or 16-bit CPU, monitor, keyboard, two floppy disk drives, and all required cards and cables.

- MINICOMPUTER - See Small System.

- OPERATING SYSTEM SOFTWARE (SYSTEMS SOFTWARE) - Software that enables the computer system to perform basic functions. Systems software, for the purposes of this report, does not include utilities or program development tools.

- PBX - Private Branch Exchange. A customer premises telephone switch.

- PERIPHERALS - Includes all input, output, and storage devices, other than main memory, which are locally connected to the main processor and are not generally included in other categories, such as terminals.

- PLANNING - Includes the development of procedures, distribution, organization, and configuration of support services. For example, capacity planning, "installation" planning.

- PLUG-COMPATIBLE MAINFRAME (PCM) - Mainframe computers that are compatible with and can execute programs on an equivalent IBM mainframe. The two major PCM vendors at this time are Amdahl and National Advanced Systems.

- PROFESSIONAL SERVICES - A category services including system design, custom programming, consulting, education, and facilities management.

- RBOC - Regional Bell Operating Company. One of seven holding companies coordinating the activities of the BOCs.

- RESELLER - A marketing organization which buys long-distance capacity for others at wholesale rates, selling services at retail but discounted prices, and profiting on the difference.

- SMALL BUSINESS COMPUTER - For the purpose of this study, a system which is built around a Central Processing Unity (CPU), has the ability to utilize at least 20M bytes of disk capacity, provides multiple CRT workstations, and offers business-oriented system software support.

- SMALL SYSTEM - Refers to traditional minicomputer and superminicomputer systems ranging from a small multi-user, 16-bit system at the low end to sophisticated 32-bit machine at the high end.

- SOFTWARE DEFINED NETWORK - A private network which uses public network facilities, and which is configurable on an as-needed basis by the user (see Virtual Private Network).

- SOFTWARE ENGINEER (SE) - The individual that responds (either on-site or via remote support) to a user's service call to repair or patch operating systems and/or applications software.

- SOFTWARE PRODUCTS - Systems and applications packages which are sold to computer users by equipment manufacturers, independent vendors, and others. Also included are fees for work performed by the vendor to implement a package at the user's site.

- SUPERMINICOMPUTER - See Small System.

- SYSTEMS INTEGRATION - The action of a single service vendor's design, development, and implementation of a system or subsystem including integration of hardware, software, and communications facilities for a customer.

- SYSTEM INTERRUPTION - Any system downtime requiring an Initial Program Lod (IPL).

- SYSTEMS HOUSE - Integrates hardware and software into a total turnkey system to satisfy the data processing requirements of the end user. May also develop system software products for license to end users.

- T-1 - Refers to a standard 1.544 megabit per second digital channel used between telephone company central offices and is now used for microwave, satellite, fiber optics, or other bypass applications.

- THIRD-PARTY MAINTENANCE (TPM) - Any service provider other than the original equipment vendor.

- TRAINING - All audio, visual, and computer-based documentation, materials, and live instruction designed to educate users and support personnel in the ongoing operation or repair of hardware and software.

- TURNKEY SYSTEM - Composed of hardware and software integrated into a total system designed to completely fulfill the processing requirements of a single application.

- VSAT - Very Small Aperture Terminal. A small satellite dish system, usually using Ku-band frequencies.

- VIRTUAL PRIVATE NETWORK - A portion of a public network dedicated to a single user.